THE Chemical Age

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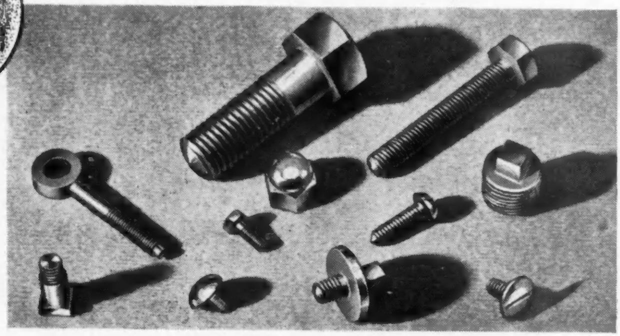

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Education Again

THE eve of August is a not inappropriate time to return to the subject of scientific education. This week or last has seen the end of the educational year for practically every school, college, and university in the country with end-of-term and annual reports making an avalanche of good news and ill. But upon the 1953/54 progress of education itself no report that was honest could indulge in those phrases that please parents or even merely make them hopeful for a brighter future. Such holiday-disturbing phrases as 'no signs of real improvement' or 'shows no inclination to be attentive' would be far more apposite than any of the first or second class clichés of pedagogy. The years go by—and little happens to change the pattern of decline and apathy. In a scientific world and age Britain's resources for producing scientists expand at a rate that cannot possibly equate with the annually rising demand, let alone make indentations upon the past's accumulated deficiency. The national bill for this neglect, when presented in the not so distant future, will be crushingly heavy.

The crux of the trouble, the supply of science teachers, remains unaltered. It has persisted throughout the post-war period and minor Burnham Scale concessions about special allowances for science teachers have so far had the effect that any sane-minded person would have expected—nil or negligible. Here and there the economic lot of existing science teachers may have been improved in the sense that the financial sacrifice of their vocation has been slightly reduced; but to the potential science teacher the nationally vital job of producing more scientists for the future become no more attractive. For proof of this there is no need to rely upon personal opinions. An official article from the Ministry of Labour on the Technical and Scientific Register (*Journal of the Royal Institute of Chemistry*, 1954, **78**, 343), and published only last week, contained this uncompromising sentence: 'It is noticeable that even amongst graduates who do not find it easy to get work in other fields, there is usually a strong disinclination to consider teaching except as a last resort.' This must be regarded as a factual and official assessment of the state of science teacher recruitment.

Between now and 1960 there will be a substantial rise in the school population. This is a consequence of the greater birth rate in the years immediately after the war and it represents something like a tidal wave relentlessly approaching our over-crowded class rooms and under-staffed schools. After 1960 there will be some decline in the school population, though it will not fall back to the level of 1950. The peak of the increase will mean some 20 per cent more children in schools than in 1950; the falling back after 1960 will lead to a fairly steady situation with about 10 per cent more children in schools than in 1950. A vigorous nation with its mind attuned to the future would look upon this surge of children as a great opportunity. Twenty per cent more children to be taught should mean at least a twenty per cent increase in the production of scientists for research and industry. A population whose higher age-groups are steadily rising and whose pension-drawing numbers will be proportionately high to a dangerous degree by 1970 or 1975 should be grasping to the full this temporary 1955-60 peak in the supply of youth and ensuring at all costs that

every scrap of natural ability will be turned into modern skill. It is, indeed, a tremendous challenge to the democratic system we defend at higher cost in arms. Yet most of the signs are that we look upon this approaching wave as a problem and a threat.

It is against this near-future background that the present and persistent shortage of science teachers must be set. The special shortage may well become mixed up with a general shortage. The ratio of teachers to children in schools is a crude measure of educational standard but most authorities are agreed that classes of more than 40 inevitably mean that even the best teaching yields poor results. So long as the comparative ratios between different types of school or between different years show large classes as a dominant feature in our main educational arrangements, this crude measure is sound enough. It measures bad effects although the other end of the scale might not measure differences in good effects. No one could pretend that the 1950 standard of education was a high one. To maintain this standard without in any way improving it, at least 33,000 more teachers will be needed in our schools of 1960. The present increase per year in teachers is about 6,000; so, in five years or so, the rise in numbers should not miss the minimum target by much, if indeed it misses it at all.

But the number of teachers requires more analysis for type than the number of children. The differences in child-need for education—elementary, secondary, scientific, etc.—are potential; those in teacher-capability are actual. The annual inflow of teachers that adds 6,000 to the total number is not providing the required balance between non-graduates and graduates, between teachers for very young children and teachers for older children. Unless the trend swiftly changes, a smaller proportion of older children in 1960 will receive even the 1950 standard of higher education; nothing yet points to even the remotest chance of an improved standard in science teaching. Nor, indeed, should the older child's response to science teaching be solely measured by the opportunity for learning scientific subjects. The ready assimilation of chemistry and physics rests first of all upon good training in other subjects. Any general decline in the teaching of basic subjects in secondary and grammar schools must mean slower learning and slower teaching in the hours allotted to science. A situation that is already bad can only become disastrously bad.

Set within this general context the recently announced developments to expand technological education seem even more trivial than they actually are. For it is the schools and schoolteachers who must first produce the trainees of technology. Mr. Butler's decision earlier this month that more money can now be spent upon technological education was both limited and guarded. Developments will take place mainly in Glasgow, Manchester, Leeds and Birmingham in addition to those already planned for the Imperial College, London, and only at centres already receiving grants through the University Grants Committee. The case for changing the status of the Bradford Technical College was dismissed at the same time that Mr. Butler dismissed the case for increasing the number of university institutions concerned with technical education. There will, therefore, be no new lamps with the old; though a few of the old ones will perhaps burn a little more brightly with increased supplies of oil. *The Economist*, seldom a critic of decisions in which Mr. Butler is concerned, is certainly not alone in regarding these as 'dubious,' nor in the suspicion that they are the outcome of academic prejudice more concerned with the conservation of university status than with the country's urgent and growing need for trained technologists.

What is most needed to improve this dismal prospect for education? The expenditure of more money, of a great deal more money, is obvious enough, but we have long been at the point when one social service cannot expand unless another contracts. Ultimately, therefore, a change in public opinion is needed, a change that will at the same time enforce improvement and accept the price to be paid for it. Creating that change in public opinion is a responsibility for all who themselves have benefited from higher education.

Notes & Comments

Under the Maple Tree

EARLIER this month (see THE CHEMICAL AGE, 1954, **71**, 117) we discussed the new surge of British capital for Canada's expanding chemical industry. Since then, data for Canada's general chemical expansion in 1953 have become available (*Canadian Chemical Processing*, 1954, **38** [6], 6), and any fear that our ability to share in this sector of Commonwealth prosperity has come too late can be comfortably dismissed. For 1953 the average works' output value of Canada's chemical industry was 6.4 per cent above that of 1952; in the heavy chemicals branch alone the rise was higher at about 10 per cent. Indeed, a good many branches scored advances well above the average—coal tar distillation products; 9.2 per cent; adhesives, 9.8 per cent; primary plastics, 27.9 per cent. The number of employees rose in 1953 by more than 2,000, or just over 4 per cent.

A Growing Share

HOWEVER, expressing progress in terms of goods value can be misleading; if prices are generally rising or if they are rising sharply in particular sectors, gains in value-output are not in fact reflecting real increases of productivity. This applies particularly to a chemical industry such as Canada's today, for in the past production has predominantly concerned itself with primary and raw materials and one of the important phases of contemporary change is the introduction of more processing and secondary product manufacture. This must inevitably increase output value even though what might be called annual chemical volume is little altered. In fact, however, this is not an over-deceptive influence. The *physical* volume of Canada's chemical output rose in 1953 by 4.3 per cent of the 1952 volume. If this index of progress is set against the output value index of 6.4 per cent, it is clear that 1953 progress has been about two-thirds a matter of genuine rise in quantitative production and one-third a rise in qualitative value. This must be regarded as a healthy balance. From another angle, the selfish one of the would-be exporter of chemicals to Canada, this story of expansion might seem dangerous. The more Canada produces, the less she is likely to need. But the facts do not support this simple argument. Not for the first time it is shown that a vigorous chemical industry increases its needs at the same time as it increases its production. Despite the advance in home output, exports of chemicals to Canada rose in 1953 by 18 per cent (value-terms). Although the British share in this total trade is still small, it rose by 50 per cent, from a value of $12,200,000 in 1952 to $18,600,000 in 1953. No annual figure has been higher in the records.

Volumetric Glassware

THE impressive growth of the British scientific glassware industry has been considerably aided by the research and advisory services of the National Physical Laboratory. The standards of accuracy that have been achieved by manufacturers are products of NPL co-operation. A new DSIR booklet in the series 'Notes on Applied Science' (1954, No. 6, Volumetric Glassware, 22 pp., HMSO, 1s. 6d.) summarises the principles on which these standards have been based, but it will not be of value only to manufacturers or apparatus buyers. It will also be of great indirect value to analysts for some of the factors that influence accuracy in using volumetric glassware are discussed. For student analysts the booklet will be a cheap and important addition to the text-book-shelf. The distinction between vessels graduated for content, e.g., flasks and cylinders, and vessels graduated for delivering a precise volume, e.g., pipettes and burettes, is emphasised, and experimental data demonstrating the importance of controlling burette delivery time are given. It is also pointed out that standards are based upon the volume of *water* that is delivered when proper delivery conditions are employed. Dilute

aqueous solutions behave similarly but liquids whose physical properties differ markedly, e.g., strong alcohol or concentrated sulphuric acid, do not. For accurate work it cannot be assumed that the volume of such liquids delivered is in fact the volume for which the vessel has been calibrated.

Keeping it Clean

SHAPE of meniscus as a factor in measurement is also discussed very fully. The influence of cleaning and the danger of leaving contaminating films is stressed. The best cleaning mixture is still given as the equal-part formulation of concentrated sulphuric acid and saturated potassium dichromate solution; 'content' and 'delivery' vessels should be left to stand filled with this mixture for several hours, then rinsed thoroughly with water. After this general routine, 'content' vessels should be rinsed with colourless methylated spirits and dried with warm air, but 'delivery' vessels are best left filled with distilled water. The increasing use of detergents for cleaning glassware is referred to cautiously. While for many purposes this may be satisfactory, all traces of detergent must be removed before calibration of the surface tension of the water and in consequence the shape of the meniscus may be sufficiently affected to introduce significant error. It is added that the complete removal of detergent traces requires care.

US Tariff Truce?

THE US Senate has voted for the extension of the Reciprocal Trade Agreements Act, not for three years as the President proposed, but for one year—until June, 1955. It has been reported that it was not a matter of deciding between one year or three for the extension but of one year at the most or no extension at all. A thorny and heated topic has been shelved. Ostensibly the reason is that the year's extension gives Congress further time in which to study the Randall Commission proposals. This may well mean 12 months of steady propaganda opposing the Randall Commission's main recommendations and the accumulative effect of this may reduce the amount and strength of public opinion now in favour of a moderate measure of tariff reform. The Randall Commission recommendation that all import duties in excess of 50 per cent *ad valorem* should be reduced to 50 per cent or less is particularly vulnerable. Nevertheless, nothing is likely to be done, for elections are in the offing and politicians are more concerned with votes than tariffs until they are re-elected. Meanwhile more and more is said on this side of the Atlantic about the pound becoming convertible. But the foundation of sterling convertibility is world trade with fewer and lower tariff walls to be jumped. If the pound is to become more easily convertible, it is surely an essential safeguard that the dollar should be less difficult to earn. Otherwise convertibility could all too swiftly bring one-way traffic.

British Fair in Copenhagen

FROM 29 September to 16 October a British trade and exhibition is being held at Copenhagen under the patronage of the King and Queen of Denmark. Organised by the British Import Union of Denmark in collaboration with the Federation of British Industries, the project will take place in the city's Tivoli Gardens and the Forum, where existing buildings will be supplemented by British-made temporary structures. A similar event in 1948 attracted over a million visitors. In a period of growing competition, it is stated, the fair and exhibition will provide a timely opportunity for British manufacturers to show Denmark and neighbouring countries the latest developments in both capital and consumer goods, ranging from heavy engineering and transport to textiles, leatherware and pottery. Inquiries from prospective exhibitors should be addressed to British Overseas Fairs Ltd., 21 Tothill Street, London, S.W.1.

Duty-Free Entry of Machinery

Earlier this year the President of the Board of Trade announced the appointment of a committee under the chairmanship of Sir Henry Wilson Smith, to consider and report on the duty-free entry of machinery into the UK. This committee, known as the Wilson Smith Committee, has now issued its report, and it was published on 22 July by HM Stationery Office, at 1s. 3d. (post free 1s. 4½d.).

*Mechanical Services in a Medium-Sized Chemical Factory**

VISITORS to the Ruabon Works of Monsanto Chemicals Ltd. often express surprise at the 'natural' camouflage of the factory and are deceived by the fact that the works is built on the hillside below the village of Cefn Mawr. The only full view of the factory is obtained by the motorist or walker travelling from Wrexham to Llangollen and even then the whole works is in full view for only a minute or so. Unless one is closely associated with the works it is difficult to realise that the production, administration buildings, laboratories and warehouses cover 67.3 acres and that one is observing the largest chemical plant in Wales.

The works produces over 100 chemicals, among which are synthetic phenol, salicylic acid, phthalic anhydride and various derivatives therefrom. The manufacture of these chemicals calls for large quantities of water, steam and electrical power.

Consultation at all Times

The Production Departments as a whole operate continuously for 51 weeks a year so that it is essential that vital production services are available at all times to meet demands. The operation of service equipment as the servant of production units leads to very close contact between engineers and chemists and ensures consultation at all times on any problems which arise in connection with these services.

In a factory consuming 65,000 tons of coal per annum to provide heat and power for chemicals manufacture, ways and means of improving efficiencies are constantly under consideration and alterations and additions to service plant made to keep in step with production demands. The position is never static and the equipment to be described is that existing at the moment.

The water requirements of the works, offices, laboratories and warehouses are met by two independent sources of supply water from the River Dee, and water from the reservoirs of the Wrexham and East Denbighshire Water Board.

Of these two sources of supply by far the greatest quantity of water is supplied direct from the River Dee, the amount of town water usage being less than ½ per cent of the total works demand.

To obtain water from the River Dee, which is approximately 130 ft. below the lowest factory level, the company has installed on the east bank of the river a pumping station of 4,320,000 gal. per day capacity. The pumphouse is situated alongside a deep pool in the river, water being fed by gravity via a coarse screen intake in the river bed through a rotary screen into a 20 in. suction pipe connected to the main pumps.

Four raw water pumps are installed in the pumphouse, each pump designed to deliver 60,000 gph. against a static head of 130 ft., total head 155 ft. Three of the pumps are driven by constant speed electrical motors and the fourth by a diesel engine electrical motor. Normally the electrical pumps are in operation, the diesel pump being on standby duty.

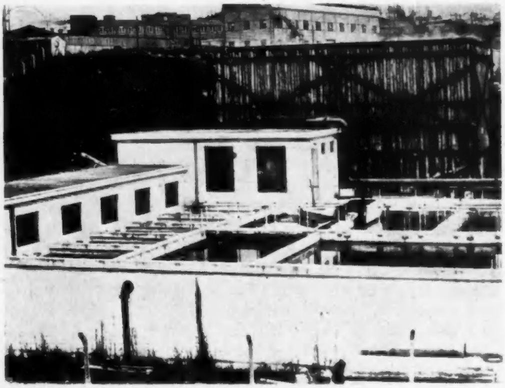
Water is delivered from the pumping station through an underground main discharging into a small reservoir which was originally part of the Shropshire Union Canal connecting the works. This reservoir has a small capacity and together with the canal arm stores about 365,000 gal. or approximately three hours' water supply.

The filtration plant is sited below the level of the reservoir so that raw water flows by gravity into the treatment plant. The complete plant consists of two sections: a filtration plant of 50,000 gph. capacity; and a circulating water system of 73,000 gph. capacity dealing with cooling water returned from the works.

Raw water is piped by gravity either to the treatment plant or, in the case of emergency, bypassed direct to the cooling tower basin. Normally raw water from the canal is fed via an intake box in the canal bank to the inlet measuring weir chamber. The flow of water to the plant is controlled by a float valve operating in step with the level of water over the main inlet weir.

Down stream of the main weir the water flows into a baffled mixing channel and is

* From a paper read before the Merseyside and N. Wales branch of the Incorporated Plant Engineers on 15 February, by D. W. Evans (Monsanto Chemicals Ltd.).



Paterson water treatment plant

treated with alumina ferric and milk of lime. From the channel the treated water is discharged into the flocculation tanks. Each tank can be isolated for cleansing when necessary. Following flocculation the water is distributed through troughs into the sedimentation tanks where the water is retained for two hours before being discharged into rapid gravity filters, the filtered water finally being discharged into the basin of the cooling tower to mix with the incoming returned water.

Sludges and waste water from the filters are piped to a specially designed waste water recovery tank where the sludges are allowed to settle, the supernatant water being pumped back to the main inlet chamber for recovery. The deposited sludges are pumped out of the settling tank to a drying bed.

The plant is fully equipped with washing and filter air blowing equipment and needs very little attention, one operator being in charge per shift.

Warm recovered water from the works is gravity fed into a large concrete return water tank situated alongside the flocculating tanks. From this tank the water is elevated to the cooling tower, the water level in the tank being controlled by a float operated valve connected to the inlet of a 73,000 gph. capacity hot water pump. The cooling tower is designed to cool 73,000 gph. of water from 100° F to 64° F in atmospheric conditions of 60° F wet bulb, dry bulb temperature 67° F. The tower is of the forced draught type wooden construction having two compartments, each compartment being equipped with one 11-ft. dia. fan.

Under certain load conditions the filtration plant has insufficient capacity to meet the works demand for process water and it is necessary to supplement the filtered water supply with raw water. During these peak periods one of two two-stage pumps is in operation. Each of these pumps is capable of delivering 60,000 gph.

The filtered and raw water is pumped into a 10 in. bore underground ring water main encircling the factory and connected by rising mains to two 50,000-gal. capacity reinforcer concrete storage towers situated at the highest level of the works. It is worth noting that these towers were constructed over 30 years ago and are still water-tight. From these towers water is piped by downcomers to the main boiler house and the works ring main. The total length of the distribution system including the pipelines to the River Dee is approximately 2½ miles.

In order to conserve as much water as possible additional cooling towers are provided inside the works to supply cooling water to turbo alternators and turbo compressors.

The system at the south end of the works is considered part of the main water distribution system, and is made up of two cooling towers, each of identical capacity but of different design.

One tower is of the natural draught type of wooden construction capable of cooling 52,500 gph. from 95° F to 75° F with a wet bulb temperature of 62° F, 100 per cent relative humidity. The remaining tower is of the induced draught type of wooden

construction. Cooling air is provided by an induced draught fan situated at the top of the tower, the fan being arranged to operate at two speeds, for winter and summer operation. The cooler has been designed to cool 52,500 gph. from 90° F to 75° F with a wet bulb temperature of 62° F.

It is interesting to compare the relative size of both towers, which are capable of the same duty, although it will be observed that with the natural draught cooler there is no direct running charge.

Steam Requirements

The total steam requirements of the works for chemical production purposes and space heating calls for steam at varying pressures from 425 to 10 psi. As far back as 1933 Monsanto realised the economic advantage of generating back pressure power when it was decided to install what was at that time a high pressure back pressure/passout power station. As the company expanded its operations, the power station was extended to keep pace with production demands.

Until very recently the main source of boiler feed water was a mixture of condensate and untreated cooling water but due to changes in factory operations this source of water is now available only on a greatly reduced scale. At the present time the make up water consists entirely of treated water. A base exchange plant has recently been commissioned which deals with the total make up water requirements of the boiler plant.

The total water requirements of the boilers and auxiliaries are met by the following sources: treated make up water from the River Dee; a mixture of cooling water and condensate, which is pumped from a collection tank sited in the works to the boiler feed tanks; condensate overflow from the turbo condensers and desuperheater system; condensed steam from turbo driven boiler feed pumps; and continuous blow-down system flash steam recovery.

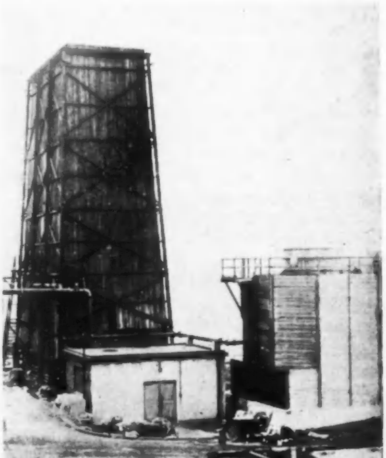
At the moment no de-aeration equipment is installed but a feed heating type de-aerator is now on order. Present practice is to raise the temperature of the feed water in the feed tanks to 212° F thus driving off dissolved gases and maintaining a vapour blanket above the feed water level to prevent re-absorption of air.

The following chemical treatment is carried out: sodium sulphite is introduced into the hot water return tank; a mixture of caustic soda and sodium sulphite is introduced into the boiler feed tanks; and Calgon is slug fed through an automatic time valve into the inlet side of the feed pumps.

This treatment has been found adequate for steaming periods up to 3,700 hours and with the introduction of a base exchange plant an appreciable increase in steaming period is expected, provided of course that the gas side of the boilers is kept free of deposits.

All boilers are fitted with continuous blow-down equipment, blow-down taking place from the lower drum. The blow-down lines from each boiler are connected to a deconcentrator sited over the main feed tanks, and flash steam from the blow-down water is recovered direct into the feed tanks. The concentrate leaves the deconcentrator via a cooling coil in the feed tanks. In this way 25 per cent of the blow-down water is recovered as distillate together with 67.5 per cent of the blow-down heat.

When there is no hot water being returned from the factory the cold treated make up water from the main storage towers passes through a tubular heat exchanger designed



The south end cooling towers ; it is interesting to compare the sizes of the two installations

to work initially from the turbo generator passout system. This heat exchanger is thermostatically controlled to maintain the outlet feed water temperature to the feed pumps at 212° F in order to de-aerate the feed water.

Use of Steam Turbines

Further heating of the feed water is carried out by the direct injection of exhaust steam from the back pressure turbines driving the feed pumps. The policy of driving the pumps by steam turbines is justified in view of the fact that the exhaust heat is required at all normal loadings and any increase of electrical auxiliary consumption could only be met by operating 'out of balance' and condensing steam. Although of varying capacity the feed pumps have stable characteristics and will parallel when necessary.

Before passing to the boilers the feed water is pumped through a final heater which uses either any excess exhaust heat available or passout steam to correct any tendency to operate out of balance with the steam/power load.

Six tri-drum water tube boilers are installed. All units steam at 425 psi., total steam temperature 690/700° F.

The load on the boilers is in the region of 130,000 lb. per hr. with peak loads of up to 145,000 lb. per hr. It is usual to have the two largest boilers on line continuously at set stoker conditions with two of the smaller units taking up the variations in load and meeting peak demands.

Consideration is being given to the installation of automatic combustion control equipment to enable load variations to be taken up on the larger boiler. This should make it possible to operate the plant at higher efficiency.

The flue gas from the furnaces is discharged into two independent self supporting steel stacks, situated at the north and south ends of the boiler plant. A common flue connects the outlet duct from the four smaller boilers to both stacks, the south stack being capable of taking the flue gas load equivalent to about 60,000 lb. per hr. evaporation.

The north stack, however, is of much larger capacity, being capable of dealing with evaporation of up to 190,000 lb. per hr. This stack is Gunite lined to combat any corrosion likely to take place due to the low exit gas temperature of the largest boiler.

At present four MVE turbo alternators are installed in the turbine room of the power station. Three of the generating sets are passout machines and one is a straight back pressure set.

Passout turbines can really be considered as being made up of two turbines, a combination of a back pressure turbine and a condensing turbine. They have the advantage of being flexible in operation and will automatically take up any 'out of balance' demands of steam and electrical power.

Cooling water is required for the condensers and oil coolers of the passout sets and also for the oil cooler of the back pressure set. Because of the comparatively large quantity required cooling towers are installed.

Unorthodox Cooling Towers

One cooler is capable of cooling 62,400 gph. water at 91° F to 71° F with atmospheric conditions of 61° F wet bulb relative humidity 68 per cent. Of the forced draught two compartment type, the tower is supported over a suspended pond of unorthodox design.

The second cooler is a rectangular reinforced concrete natural draught cooling tower. This tower was designed to cool 2,600 gpm. cooling water from 105° F to 93.8° F with a wet bulb temperature of 80° F relative humidity. The tower is again of unorthodox design, having vertical cooling sheets instead of the normal timber lath packing, heat transfer taking place across a film of water as against the normal flow across water droplets.

One of the major problems confronting engineers designing equipment for installation in an existing works operating passout turbines is the maintaining of a correct steam/power balance. The operating conditions are very seldom constant in a works like ours and there are three possible conditions of operation:

1. In balance with minimum steam to condensers.
2. Out of balance in favour of steam.
3. Out of balance in favour of power.

Condition 3 is the one which causes us most concern since any increase in condenser loads wastes fuel and increases the cost of power beyond economical limit.

Fortunately, it has never been necessary to operate at high condenser loads. Ideally a new plant should utilise a definite ratio of steam to electrical power and while in some cases this is possible, in others it is an extremely difficult matter. Sometimes it is necessary to resort to practices which at first sight appear to be uneconomical, a case in point being the widespread use of steam operated air pumps for distillation, drying and general purposes. Steam to these ejectors is supplied off the turbine passout system so that in expanding down to passout pressure it has already generated power.

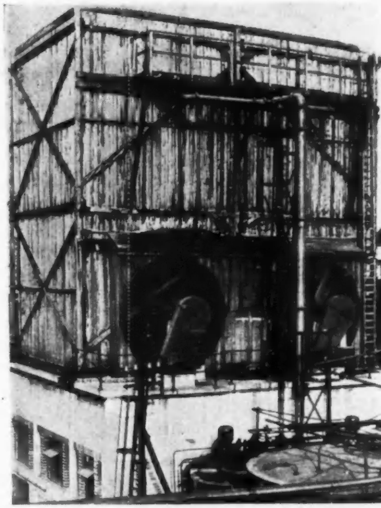
Several Advantages

Reverting to the use of steam operated ejectors: apart from considerations of fuel savings, they have been well tried in our works for many years and from the point of view of ease of installation, low first cost, simplicity of operation, reliability and maintenance, there is a good deal to be said in their favour.

Ideally, of course, users should make use of the exhaust steam from ejectors, but unfortunately this is very often contaminated, although in some cases it is possible to utilise for heating water or liquors. One has to remember however that an increase in back pressure increases the steam consumption.

This year every major user of steam in the factory will be supplied through a meter. It is interesting to compare some of the missing steam figures over the past two years. In June of 1952, the unaccounted steam was 14 per cent of the total steam exported by both power station and waste heat recovery systems in the factory. By the end of 1953 this had been reduced to 0.56 per cent and the latest figures for January, 1954, show the weight loss to be 0.25 per cent.

This reduction of missing steam by weight to the present figure has a marked bearing on the cost of finished products because the final steam charged to the user is based upon the actual distributed steam and not on the total steam exported by the power station. Apart from the values of steam meters in this direction, they are a necessity if savings in steam caused by better utilisation are to be calculated. For example, a recent modification to a trapping system in one plant showed an immediate saving of 10 per cent. The value of such charges cannot be demonstrated without efficient meters.



The forced-draught cooling tower with its 'suspended pond'

Phase Transformations

THE Metal Physics Committee of the Institute of Metals is proposing to hold in London a one-day symposium on 'The Mechanism of Phase Transformations in Metals,' at a date which will probably be in November 1955. The symposium will be in two parts, the morning session being devoted to transformations which are largely governed by thermal activation (nucleation and growth reactions) and the afternoon session to transformations in which thermal activation is less important (martensitic reactions).

Review papers are being invited to introduce each session, but in addition the committee will be glad to consider offers of short original contributions (up to 3,000 words) from workers in the field of phase transformations. In these contributions emphasis should be laid on the experimental results and their interpretation rather than on details of experiment technique.

Anybody wishing to submit a short communication of this kind is invited to send the title and a brief summary, as soon as possible, to the editor, The Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

The Export Situation

Business Variable, But Higher Daily Average

JUNE was a short month, consisting of only 24 working days compared with May's 26; proportionately, therefore, £17,256,570 compared with £18,195,801 represents a further rise in the value of Britain's chemical exports. Moreover, in a month when most totals are slightly lower, increases over May's figures are particularly striking.

In the class of chemical elements and compounds, lead tetra-ethyl continues its meteoric rise; this, no doubt, is attributable to the recent increases in output of the Associated Ethyl Co. The alkalis maintain their increases, but copper sulphate, after beginning the year well, has fallen steadily below last year's figures. The falling-off in organic liquids connected with explosives manufacture—glycerine and acetone—continues; and aluminium oxide, after a sudden jump in May, returned to its former level.

Benzole at present shows no signs of resuming its marked fluctuation, but coal tar has fallen again. After their disappointing start at the beginning of the year, fertilisers are now increasing steadily; it seems probable, however, that figures for the year will again be well below the previous year's. The increasing popularity of ammonium sulphate over nitrate is clearly indicated. In nearly all classes, organic synthetics are down compared with May's figures, but the situation is on the whole bright.

Value of exports to the US continues to fall, but business remains good with most of the Commonwealth countries, Scandinavia and Western Europe generally. Figures for Egypt have decreased sharply, and demand from the Argentine is less.

TABLE 1

VALUE OF EXPORTS IN £: PRINCIPAL COMMODITIES

	June 1954	May 1954	June 1953
Acids, inorganic	39,662	63,611	42,428
Copper sulphate	270,678	232,700	389,132
Sodium hydroxide	457,305	637,494	294,537
Sodium cabonate	281,230	284,382	163,867
Aluminium oxide, anhydrous	154	45,671	805
Aluminium sulphate	44,212	42,060	29,108
Calcium compounds, inorganic	50,744	70,648	68,851
Magnesium compounds	59,854	50,501	43,232
Nickel salts	52,980	58,844	64,513
Glycerine	30,814	11,585	144,366
Ethyl, methyl, etc., alcohols	102,769	165,415	87,283
Acetone	20,768	33,063	47,819
Lead tetra-ethyl	918,886	692,583	94,066
Total for chemical elements and compounds	**5,141,290**	**5,452,270**	**4,021,672**
Coal tar	101,665	293,733	85,668
Cresylic acid	44,194	46,140	55,589
Benzole	210,743	209,393	170,795
Creosote oil	51,218	55,720	202,554
Total from coal tar, etc.	**441,112**	**625,644**	**537,575**
Indigo, synthetic	79,298	104,564	75,698
Total for synthetic dyestuffs	**830,281**	**1,004,965**	**490,166**
Medicinal and pharmaceutical products, total	**2,618,864**	**2,909,251**	**2,196,741**
Essential oils—			
Natural	35,663	43,375	31,826
Synthetic	56,667	50,422	64,439
Flavouring essences, etc.	101,113	102,680	89,585
Total for essential oils, perfumes, etc.	**1,763,531**	**1,869,722**	**1,411,562**
Ammonium nitrate	11,185	13,945	47,137
Ammonium sulphate	600,004	345,496	462,134
Total for all fertilisers	**637,320**	**405,533**	**534,552**
Paints, pigments and tannins, total	**1,550,838**	**1,633,170**	**1,167,240**
Plastics materials, total	**1.823,768**	**2,018,674**	**1,519,345**

TABLE 2

VALUE OF EXPORTS IN £: PRINCIPAL COMMODITIES

	June 1954	May 1954	June 1953
Gold Coast	277,116	324,424	269,891
Nigeria	250,086	302,882	338,600
South Africa	853,610	824,128	775,404
India	1,207,660	1,358,193	955,153
Pakistan	582,300	530,895	111,882
Singapore	305,197	289,522	247,683
Malaya	237,602	258,440	186,827
Ceylon	275,311	268,176	240,831
Hong Kong	286,246	273,992	221,156
Australia	1,373,295	1,447,443	943,234
New Zealand	628,903	534,585	306,638
Canada	506,754	652,901	474,557
Eire	619,585	601,843	573,340
Finland	227,563	269,675	103,907
Sweden	568,412	529,426	264,724
Norway	229,020	265,111	215,244
Denmark	232,692	354,543	261,321
Western Germany	571,164	666,893	217,757
Netherlands	649,446	622,911	505,807
Belgium	319,009	391,329	316,392
France	432,834	470,092	459,586
Switzerland	270,484	233,634	145,823
Italy	461,945	425,178	293,708
Egypt	198,509	303,973	244,980
US	456,357	648,842	941,567
Argentine	304,737	322,472	77,840
Total value of chemical exports	**17,256,570**	**18,195,801**	**13,615,323**

MIDLANDS SOCIETY FOR ANALYTICAL CHEMISTRY

Solvent Extraction Methods in Inorganic Analysis—Part II

In the first part of this article, which appeared last week (p. 171), Dr. T. S. West, of the University of Birmingham, described the formation of inorganic complexes and organo-metallic salts in the solvent extraction of iron, antimony, arsenic, chromium, lead, bismuth, tantalum, niobium and cobalt. The first section of the remainder of the article (below) deals with separation of rare earths and thorium.

SEPARATION of the rare earths is naturally one of the problems which has been attempted by solvent extraction methods. Appleton and Selwood reported a separation factor of 1.06 in favour of neodymium in extracting solutions of neodymium and lanthanum thiocyantes with *n*-butanol. Templeton and Peterson used *n*-hexanol to achieve a separation factor of 1.5 in extracting the nitrates, but to achieve this factor the solution had to be 90 per cent saturated with respect to the mixed nitrates. The authors concluded that there was sufficient difference in the extractability of the rare earths to suggest a practical separation process, but that such a method would involve handling relatively large amounts of material.

Asselin, Auderith and Comings examined a wide variety of solvents for the extraction of rare earth salts. They observed that the rare earth chlorides are extracted but slightly by *n*-butanol, but that the nitrate are more soluble. The order of extractability is Nd > Y > Th. Sufficient differences in the extractability of the various materials exist to offer possibilities of separation. *n*-Pentanol extracts thorium much more readily than the rare earths from thiocyanate so that an effective means of separating the two is available.

Scadden and Ballon reported the separation of the yttrium and lanthanum groups by solvent extraction of the yttrium earths into a 0.6M solution of di-*n*-butylphosphoric acid in di-*n*-butyl ether. Ninety-five per cent of the first group is extracted with only 2 per cent of the lanthanum earths. These experiments indicate that the isolation of individual rare earths may be possible by a multi-stage extraction procedure.

Weaver, Kappelmann and Topp followed up the work of Peppard, who obtained a separation factor of *ca.* 2 between adjacent ion earths on a tracer scale, by applying his tri-*n*-butyl phosphate method to the extraction of gadolinium from 12N nitric acid solution. In this way the first kilogram of pure gadolinium oxide was obtained. A large scale counter current extraction procedure was employed.

CHELATE COMPOUNDS

The theory of solvent extraction of metal chelates has been developed by Irving and Williams. While the process is by no means simple, it is much more amenable to such treatment than the solvent extraction of inorganic compounds. Most metal chelates form uncharged molecules of low solubility in aqueous solutions and these are readily extracted into non-miscible organic solvents. It is noteworthy, however, that where chelation results in the formation of charged organo-metallic complexes, extraction can rarely be accomplished as in the case of the chelation compounds with the complexones and reagents such as *o*-phenanthroline, αα′-dipyridyl, etc. Even here, however, it is possible to effect extraction by careful selection of the anion. Thus ferrous iron may be extracted as the perchlorate salt of the ferroin complex. This may be entirely due to the marked solubility of perchlorates in general in non-miscible organic solvents.

Oxine, Dithizone. Cupferron

8-Hydroxyquinoline (oxine) is one of the reagents most used in the determination of small amounts of metals in solution. The precipitated compound may be weighed or titrated bromometrically, or alternatively, it may be extracted into an organic solvent and the light absorbency of the extract may be measured. The solvent extraction of a metal from aqueous solution by means of a solution of oxine in chloroform is therefore particularly valuable in colorimetry. Selective determination may be obtained by careful control of *p*H (so that the desired metal is

extracted with the minimum number of others) and by using a narrow waveband filter on the absorptiometer.

The limited solubility of the oxinates in aqueous solution, and to a lesser extent in solvents such as chloroform, makes the method suitable only for dilute solution work. It is useless as a macro extraction procedure. The same remarks apply more or less to the extraction of the metal compounds of dithizone, cupferron, etc. Moeller and his co-workers and Gentry and Sherrington have examined the extraction of the oxinates fairly extensively. Furman, Mason and Pekola have thoroughly reviewed the extraction of metal cupferrates, and Irving *et al.* have examined the behaviour of dithizone compounds.

Moeller and Jackson have reported that whereas the oxinates of the tri-positive rare earths are not quantitatively extracted into chloroform, the corresponding 5,7-dichloro-8-hydroxyquinolates are. A fractional separation of the rare earths is possible since the *p*H ranges for extraction overlap. These results are rather interesting inasmuch as they may act as sign posts for future development of organic reagents designed specifically for solvent extraction purposes.

The 5,7-dibromo substituted oxine is a stronger acid than oxine itself and its metal derivatives might therefore be expected to be more ionic and therefore less soluble in an organic medium. The apparent anomaly is ascribed to the reduced solubility of the chloro chelates in water and their consequent resistance to hydrolysis which would decrease the extent of extraction.

1,3-Diketones

The 1,3-diketones form inner complex compounds with many ions. The simplest member of the group, acetyl acetone, forms over 60 metal chelates of good stability. The solubility of the acetylacetonates in organic solvents is of a much higher order than most of the chelates used in extraction (i.e., of the order of g. per l. rather than mg. per l.). The acetyl acetone itself may be used as solvent as well as reagent, since it has only a limited solubility in water. It may also be used as a solution in a non-polar solvent such as benzene, etc.

Steinbach and Freiser establish that the extraction is a function of *p*H and is independent of the concentration of the metal. The *p*H at which 50 per cent extraction occurs is known as the $p\mathrm{H}_{\frac{1}{2}}$ value, and is characteristic of the metal. Furthermore, since the gradient of the extraction curve is purely a function of the valency, the position and shape of the extraction curve is defined by these two values. A comparison of the $p\mathrm{H}_{\frac{1}{2}}$ values serves to indicate the ease of separation of the two metals. The solubility of the acetyl acetone in the aqueous phase serves two very useful purposes: it permits extraction from more acidic solutions than has hitherto been possible; and a constant reagent concentration is maintained in the aqueous phase whether large or small amounts of metal are being extracted.

Cu: $p\mathrm{H}_{\frac{1}{2}} = 1.10$ Zn: $p\mathrm{H}_{\frac{1}{2}} = 5.10$ Be: $p\mathrm{H}_{\frac{1}{2}} = 0.67$

From these values one can predict a good solvent separation of either Cu or Be from zinc, but not copper from beryllium. Hydrolysis occurs before the extraction of zinc can become complete.

Complete Extraction of Be

Using a chloroform solution of the reagent Adam, Booth and Strickland obtained a complete separation of microgram amounts of beryllium from uranium, lead, silver, cerium, copper, molybdenum, zinc, chromium, manganese, the alkaline earths and the alkali metals at *p*H 6-10. Aluminium and iron were also extracted with the beryllium, but these can be removed in a preliminary oxine extraction.

Torribara and Sherman compared the suitability of acetyl acetone and another diketone, thenoyltrifluoroacetone (TTA), as extractants and found in favour of the former since the latter is so stable that a period of some 80 hours is necessary to re-extract even micro amounts of beryllium from the benzene phase. These authors recommend a *p*H of 4-5.

On the other hand, Bolomey and Wish prefer to use thenoyltrifluoroacetone since it is more stable in the low *p*H ranges and is relatively more insoluble in the aqueous phase. The optimum *p*H for extraction into a benzene layer containing TTA is 7.

Stene separated aluminium, iron, beryllium, cerium and copper from calcium, magnesium, manganese, cobalt, nickel, zinc, titanium, etc., using a reagent solution of acetyl acetone in carbon tetrachloride or chloroform at *p*H 4.5-7.5. Abrahamezik similarly separated iron, aluminium and managanese from calcium and magnesium in weakly alkaline solution, while Miller and Chalmers used ether and acetyl acetone to

extract aluminium and beryllium from calcium, magnesium and manganese at pH 6-7 after a preliminary extraction of metals such as iron and titanium by cupferron. The aluminium was recovered from the ether layer by stripping with 6N hydrochloric acid.

Calvin and Reed suggested the use of thenoyltrifluoroacetone as a chelating agent for copper. It was subsequently proposed as a reagent for the extraction of zirconium from aqueous solution. The zirconium is bonded directly to one of the oxygen groups and is co-ordinately linked to the other in such a manner that the two double bonds in the zirconium ring are said to be capable of resonating between the two carbon-oxygen and carbon-carbon bonds. The extraction occurs favourably in 2M perchloric acid solution.

Huffman and Beaufait showed that a fractional separation of zirconium and hafnium could be obtained using this reagent. They were able to prepare hafnium containing only 0.4 per cent zirconium with a 50 per cent yield by three extractions of a product originally containing 5 per cent. The extraction was again carried out from perchloric acid solution. Meinke and Anderson used the reagent in benzene solution for the separation, by a continuous process, of thorium from actinium and radium isotopes present in the thorium after cyclotron bombardment. The extraction took place from a nitric acid medium buffered at pH 2.5. Back-extraction was obtained by stripping with 2N acid. Other metals were removed from the raffinate at pH values over 2.5.

Schultz and Larsen reported the use of a benzene solution of trifluoroacetone for the fractional separation of zirconium and hafnium. The zirconium is preferentially extracted from 0.2M hydrochloric acid. Two extractions reduced the percentage of hafnium in admixture with zirconium from 1.56 to 0.1 per cent while six extractions increased the molar percentage of hafnium from 7.5 to *ca.* 80 per cent with 37.6 per cent yield of the hafnium.

Sulphur All Over the World

No Immediate Change Expected in Prices

WITH its 5th edition, the Quarterly Bulletin of the Sulphur Exploration Syndicate (35 Portland Place, W.1) enters into the second year of publication. In view of the widespread interest in the economic utilisation of sulphur ores it was thought useful to include in future editions of the Bulletin a review of the principal modern refining processes that have been developed in recent years.

Commonwealth countries reviewed in this Bulletin are India and Pakistan. In India sulphur consumption in all forms is at present 145,000 tons. Of this about three-fifths is derived from gypsum used in direct manufacture of ammonium sulphate, and the balance of about 60,000 tons is imported brimstone. The impressive expansion programme of the sulphuric acid industry which, by 1955, is expected to double present acid output to 200,000 tons, is almost exclusively based on brimstone usage.

Although, in their desire for greater self-sufficiency, the Indian Government's Development Council seeks to promote the use of the country's abundant pyrites resources, it is thought unlikely that this can be achieved economically for some years to come. The increasing requirements of 'regular' sulphur added to anticipated 'acid' sulphur usage are expected to raise India's import requirements to about 100,000 tons per annum by 1955. At the same time, increased ammonium sulphate production from gypsum should raise the country's total sulphur consumption by 1955 to 230,000-240,000 tons per annum.

The sulphur industry of Pakistan is as yet insignificant and total annual sulphur consumption is less than 1,500 tons, almost exclusively in the form of imported brimstone. Abundant resources of sulphur bearing raw materials such as rock sulphur, gypsum, pyrites and the anticipated arising of sulphur recovered from natural gas should promote the steady growth of the country's sulphur industry within the framework of her general industrial development.

In the US, production of native sulphur in the first quarter of 1954 reached the

highest level yet attained in any quarter. Total output of native and recovered sulphur was at an annual rate of 5,850,000 tons, or 6½ per cent greater than in 1953. Due to reduced deliveries to the home market and moderate export demand, producers' stocks increased substantially, and by the end of March totalled over 3,250,000 tons of native and recovered sulphur, the highest level since mid-1948.

Record UK Consumption

In the UK consumption during the first quarter of 1954 of sulphur in all forms reached the highest level on record, at an annual rate of 860,000 tons, or 14 per cent higher than consumption in 1953. Consumption of brimstone at an annual rate of nearly 375,000 tons continued at the high level of the preceding quarter. Strong industrial activity lifted 'regular' sulphur demand to the peak level of 1950. 'Acid' sulphur consumption, although still approaching an annual rate of 260,000 tons, represented only 34.75 per cent of sulphur in raw materials for acid manufacture, compared with 38.25 per cent in 1953. By the end of the quarter the addition of new pyrites roasting plants raised consumption to an annual rate of 620,000 tons, the highest on record. Both sulphuric acid production, 3 per cent higher than in the preceding quarter, and consumption, 4 per cent higher, rose to a record level at an annual rate of over 2,100,000 tons.

The completion during the summer months of the last new pyrites acid plants installed under the conversion programme is intended to raise further the proportion of acid produced from this raw material to about 40 per cent. With additional 75,000 tons gypsum-acid capacity coming on stream this year, and 225,000 tons in 1955, brimstone acid production may account for only about 15 per cent of total output.

The first in the series of sulphur ore refining processes to be described in the Quarterly Bulletin is the Masobello process, Impianti Speciali per L'Industria, Milan. This is based on retort distillation, and the first plant embodying this process has been in operation for about three months at Montecatini's Perticara mine in northern Italy. The sulphur ore refining process developed by Zahn & Company of Hameln, Western Germany, is based on the use of carbon disulphide as solvent. The first plant using this process has been operated since April by Azufrera Polan, Chile. The full description of the exit gas plant at the Avonmouth works of the National Smelting Corporation, to which reference was made in Bulletin No. 4, includes details of the utilisation of recovered sulphur in ammonium sulphate production.

The activities during 1953 of the two principal European pyrites producers, Spain and Cyprus, are reviewed. Spanish production at about 2,000,000 tons was nearly 500,000 tons (30 per cent) lower than in 1952, due to a severe cut in exports. Exports from Cyprus receded only about 11 per cent, partly on account of consumers' quality preference. Cyprus holds the position of the largest exporters within the Commonwealth with nearly 400,000 tons per annum sulphur content.

There has been no change in world sulphur prices, and none is expected for at least six to nine months. The US domestic sales and export demand is at present being met comfortably. Mexican producers confidently expect to contribute at the rate of about 500,000 tons per annum from autumn 1954 onwards, which, if fulfilled, may introduce a measure of competition into world sulphur markets.

The medium-term supply outlook has been somewhat clarified by the actual confirmation of the existence of an off-shore dome in the Gulf of Mexico. It is, however, doubtful whether at present price levels this could be exploited.

Success in perfecting sulphur ore refining processes that would permit competitive production with Frasch sulphur is thought to be nearer, and this source may, within its quantitatively limited field, help to remove the fear of recurring supply shortage until large scale recovery of sulphur from natural and industrial gases can safeguard increasing long-term needs.

Exemptions from KID

The Treasury have made an Order under Section 10(5) of the Finance Act, 1926, exempting the following articles from Key Industry Duty, for the period 21 July to 18 August: Anthranilic acid; *p*-chlorotoluene; diallyl phthalate; 2,6-di*tert*butyl-*p*-cresol; diphenylamine; N-monomethylaniline; piperonylic acid; sodium riboflavine-5-phosphate; tetrahydrofuran; and 2,4-xylenol.

Training for Applied Science

Royal Chartered Colleges of Technology Recommended

URGENT need for a steadily continuing expansion of facilities for training in applied science to meet the unsatisfied demand for scientists, engineers and other types of qualified technologists in British industry, particularly in the metallurgical and chemical fields, is underlined in a Memorandum on Higher Technological Education drawn up by a sub-committee of the Parliamentary and Scientific Committee, and sent to the Chancellor of the Exchequer, the Minister of Education and other Ministers concerned.

The committee recommend that a few colleges of technology should be selected and granted a Royal Charter under which they would be described as Royal Chartered Colleges of Technology. These selected colleges should be provided with strong and independent governing bodies having adequate representation of industrial, commercial and university interests in the region, as well as of the local education authorities and the Ministry of Education.

Having regard to the practical and financial considerations, the committee consider that it would be desirable to start a limited number of these colleges, rather than attempt to spread the resources available over the total number at which it was finally proposed to aim.

Supplementary Source

These Royal Chartered Colleges of Technology, says the report, should provide an invaluable supplementary source to the universities for supplying the number of highly qualified technologists of which the country stood in urgent need. They should provide for an advanced full-time 'sandwich' and part-time day and evening courses, post-graduate courses, and research on a full-time and part-time basis. It was also desirable that the colleges which were selected for the grant of Royal Charters should associate their advanced work with research and should be capable of preparing students for higher degrees.

The report states that the committee had given very careful consideration to the problem of awards, which had bedevilled the discussion of higher technological education for many years. After considering all the alternative proposals it had come to the conclusion that for the Royal Chartered Colleges of the standard envisaged in the report, the appropriate award would be a Bachelor of Technology. The committee thought that no doubt other types of award would be developed by the colleges for themselves for technologies which did not come up to the scientific and professional standard envisaged. It was important, whatever first award was given, that it should qualify for post-graduate work in a Royal College or University.

Better Quality Necessary

There was overwhelming evidence, the report stresses, that the ability of universities and colleges of technology to turn out an adequate number of science graduates of sufficiently high quality was to a very large extent dependent not only on an improvement in the quality of the intake from the schools, but also on the creation of a bigger demand from the school population of the country for education in science and technology.

There must be, the report emphasises, a 'change of climate' relating to science and technology and an improvement of facilities for teaching science and technology, at grammar schools and public schools.

The situation with regard to the shortage of science teachers was a matter of the most extreme urgency, and the committee hoped that the Government would take early appropriate action.

It is suggested that there should be some effective body, possibly organised by the Federation of British Industry, the National Union of Manufacturers and the Associated British Chambers of Commerce, with the duty of publicising at all schools what careers were available in industry on the technological side.

The committee expressed the hope that the Government would continue to support the financial requirements of the universities on the same bold and generous scale as had been agreed by all Governments since the war. The arbitrary dictum of the Barlow Committee that the number of art students at the university should be doubled

[*continued overleaf*

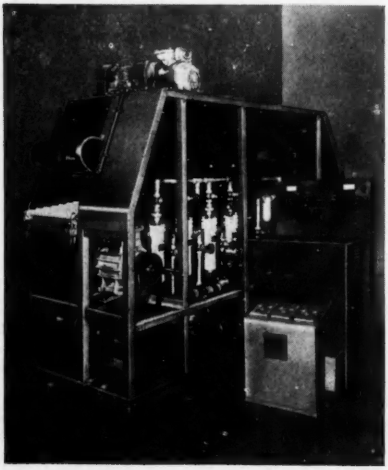
First in the World

Ultrasonic Cleaning Plant

A PLANT which is the first of its kind in Europe and believed to be the first completely automatic unit in the world has been made to the order of a well-known firm who require to clean small precision engineering parts to a degree not obtainable with conventional cleaning machinery. It is produced jointly by Ultrasonics Ltd. and Mullard Ltd., who were approached by the Board of Trade some two months ago. The company who ordered this plant wished to import a machine from the US, but they were referred to the above companies to see if a unit could be produced in this country. No information was available as to the type of plant produced in the US and this unit had to be designed and produced from scratch in two months.

If an article, to which foreign particles, grease or other matter are adhering, is vibrated ultrasonically in a bath containing a suitable fluid, the part will be made clean. A suitable frequency and intensity are necessary, depending on the nature of the material to be cleaned.

In this particular plant the frequency is 1 Mc. and the maximum intensity at the transducers approximately 5 W per sq. cm. This means that the generator, which has an output capacity of 2.5 kW, is sending out electrical pulses at the rate of 1,000,000 per second. The transducers, which are in this case barium titanate, vibrate in sympathy with the frequency of the generator and the energy is transferred from the transducers directly into the liquid.



Barium titanate has the advantage over quartz of needing only low voltages for excitation, and can therefore be operated in direct contact with the liquid.

The parts to be cleaned are placed in open wire mesh trays. These run into the plant on rollers and are automatically backed up on a conveyor which takes them through the two stage cleaning process. The cleaning fluid is re-circulated through a magnetic filter in the first stage, and a combination of magnetic and ceramic filters in the second stage. It is estimated that over 1,000,000 parts will be cleaned daily in this machine. The variable speed drive on the conveyor allows considerable latitude so that the plant can be run at a speed to match the production rate of the preceding processes.

The cleaning fluid in the tanks can be removed simply by the operation of valves, and a new charge introduced. The fluid, which will become charged with oil in the course of time, will be delivered by the pumps on the plant to distillation equipment so that it can be used again.

Technological Training

continued from previous page]

as well as the number of science students, should now be abandoned. The University Grants Committee should give increasing attention to the problem of ensuring that the universities would provide the country with an increasing number of scientists and technologists within the student population. The committee considered that there were also valuable opportunities for universities to expand their post-graduate facilities, particularly in specialised fields of study which may be of importance to industrial interests in the area where they were situated.

While agreeing that there had been considerable progress during the past ten years, the committee stated that they were still convinced that further large-scale developments in higher technological education were vital to the country's future prosperity, and that accordingly everything possible should be done to obtain unanimity and enthusiasm on the part of all concerned.

Big Investments by IG Successors

Substantial Expenditure Planned for Plant & Research

LARGE sums of additional capital required for further plant investments present German chemical manufacturers with their most difficult problem at present, it was disclosed two weeks ago at the shareholders' meetings of the IG-Farben successors, the first ones to be held since the war. While Badische Anilin- und Soda-Fabrik (BASF) last year reduced its plant investments from DM. 105,000,000 to DM. 76,500,000 and is unlikely to equal this year the rate of investment of earlier post-war years as most of the wartime damage has by now been made good, Farbenfabriken Bayer will spend a sum substantially in excess of DM. 100,000,000 on new plant this year, and Farbwerke Höchst also recognises the need for considerable additional capital expenditure to maintain its competitive strength in foreign markets. Expenditure on research also reaches a very high total; Farbwerke Höchst spent DM. 60,000,000 on research and development including new laboratories last year, while BASF and Bayer spent over DM. 40,000,000 each on research. Between four and six per cent of the annual turnover is being spent on research by the three companies.

Expanding Sales Hopes

Farbenfabriken Bayer obtained an increase in sales of over 10 per cent in the first six months of this year, and a similar increase is expected for the whole year, raising total sales in 1954 to DM. 1,125,000,000 to which exports are expected to contribute DM. 440,000,000 compared with DM. 351,000,000 in 1953 and DM. 267,000,000 in 1952. Farbwerke Höchst reached a turnover of DM. 500,000000 in the first half of this year and expect to exceed total sales of DM. 1,000,000,000 for the first time this year, as compared with DM. 943,000,000 in 1953. BASF also reached a turnover of DM. 500,000,000 in the first half of this year, compared with DM. 885,000,000 in the whole of 1953, but apparently does not expect to equal this figure in the second half of this year because it included some big items of a seasonal character. While the sales expansion has thus slowed down, the prospects are viewed with confidence.

The biggest investments are being made in the field of plastics and fibres. Farbwerke Höchst report that for the first time plastics are making a bigger contribution to total sales than dyestuffs. Cassella Farbwerke Mainkur and Farbenfabriken Bayer have each started making a poly-acrylonitrile fibre at a monthly rate of 30-40 tons; the Bayer fibre is stated to be virtually identical with Orlon 42. Terylene made under licence in Germany will be placed on the market by Farbwerke Höchst around the beginning of 1955. Farbenfabriken Bayer have extended their range of man-made fibres by putting a new acetate fibre and Perlon yarn on the market.

Growing Demands

The production of isocyanates—Moltopren, Desmodur, Desmophen, Vulcollan—will start at Farbenfabriken Bayer in September at a monthly rate of 2,000 tons and this may be doubled before long; at present output is at the rate of 400-500 tons a month. BASF, which last year opened a big polythene plant at Ludwigshafen and joined Deutsche Shell AG in a new enterprise for the production of polythene at Wesseling, now explains that the latter step was taken because demand continued in excess of the productive possibilities at Ludwigshafen.

Generally it is stated by the IG-Farben successors that a large part of the output and sales expansion is due to the starting of new production. More new plants and products are expected to become available in the near future, opening a prospect of further increases in sales.

The IG-Farben plant at Rottweil, the only works in the Federal Republic which had not yet been disposed of, has now come under the control of an international group connected with the Comptoir Textiles Artificiels SA, Paris, as no German group showed any interest in acquiring this plant, which specialises in the production of rayon and Perlon. As a result, two of the half dozen West German companies interested in the production of Perlon are now under foreign control. Deutsche Rhodiaceta, which is French-controlled, is now making nylon and a new fibre called Nyflor (which

is said to combine the advantage of both polyamide fibres) in addition to Perlon.

Chemische Werke Hüls, now one of the leading producers of plastics, solvents, plasticisers and detergent materials, will spend DM. 60,000,000 on new plant and extensions this year as the present capacity is still insufficient to meet customers' demands in all products. Extensions scheduled to come into production within the next few weeks are to raise capacity by about 30 per cent of present production. The company reports that it has established co-operation in various fields, especially the production of intermediate products for the manufacture of synthetic rubber, with various US companies.

Standard Chemical Names

ONE of the latest standards to be issued by the British Standards Institution is BS.2474, 'Recommended common names for chemicals used in industry.' The standard is in two parts, the first and larger giving recommendations on the nomenclature for all classes of chemicals used in industry, the second part giving a list of recommended names for grades of certain of these. Names which are undesirable on grounds of ambiguity, safety, etc., are listed as 'deprecated,' and others, which may be systematically correct, but which are not recommended for industrial use, are given as 'non-preferred.' The list does not purport to be complete, but the names given are intended to provide a guide to the naming of related compounds which are omitted. The standard may be obtained from the British Standards Institution Sales Branch, 2 Park Street, London, W.1, price 10s.

Industrial Opportunities in Scotland

During the resumed debate in the Commons on 19 July, on Scottish problems, Mr. Peter Thorneycroft, President of the Board of Trade, examined Scotland as an area of opportunity for new industrial development, and named oil refineries, chemicals, and atomic energy, etc., among fields of activity giving much satisfaction alongside the basic industries. 'I hope and wish,' he said, 'these opportunities will be taken to the general benefit of Scotland and the UK as a whole.'

New A.M.I.Chem.E. Exam

REGULATIONS for the admission of student, graduate and corporate members and for the examination of the Institution of Chemical Engineers have been issued as a booklet by the Institution authorities. They represent, it is stated, the first publication in detail by the Institution of its practice with regard to assessment for election to membership, while, in addition, details are given of a new examination which is to be introduced in 1956 to replace the present Associate Membership examination.

The examination syllabus now comprises: Part 1, paper A, Physical Chemistry and Principles of Thermodynamics; paper B, Inorganic and Organic Chemistry; paper C, Strength of Materials, Machine and Structural Design; paper D, Engineering Drawing; Part 2, paper E, Combustion Processes, Heat Transfer and Heat Engines; paper F, Flow of Fluids and Theory of Mass Transfer; paper G, Process Plant; paper H, Plant Construction and Works Practice Part 3, Home Paper, A Problem in Chemical Engineering Plant Design.

It is stated that the examination qualifications for membership are related to the appropriate by-laws and are in operation in so far as they apply to the present examination.

Nitrate Prices Down

NEW agricultural prices, representing a decrease of 2s. 6d. per ton, for Chilean nitrate of soda and potash nitrate fertiliser for the 1954-55 season, operative from 1 July, in lots of not less than 6 tons delivered carriage paid to any railway station in Britain or c.i.f. main ports in the Isle of Man, are announced by the Nitrate Corporation of Chile Ltd., as follows: per ton of 2,240 lb. (gross weight) nitrate of soda (16 per cent N), July-September £25 15s., October-November £26, December-February £26 5s., March-June £26 10s.; potash nitrate (15 per cent N and 10 per cent K_2O), July-September £28 5s., October-November £28 10s., December-February £28 15s., March-June £29. The industrial price of refined granulated nitrate of soda, over 90 per cent, in lots of 6 tons or more, delivered, remains at £27 10s. per ton.

HANDBUCH DER ANORGANISCHEN PRAPARATIVEN CHEMIE. Edited by G. Brauer. Ferdinand Enke Verlag, Stuttgart. Pt. 6, 1952: Pts. 7-8, 1953: Pt. 9, 1954. Pts. 6-8 each pp. 160: Pt. 3 pp. xix + 160. Each part DM. 21.

This work, of which the earlier parts have already been reviewed in this journal, is now complete with the appearance of the ninth part. As already emphasised in previous reviews, the completed work (suitably bound in two or three convenient volumes to stand up to hard wear) will form an invaluable reference for the inorganic chemist, and indeed for all those requiring for any purpose to carry out inorganic syntheses. The final part includes a very detailed table of contents, comprehensive formula, substance and technique indexes, the foreword to the complete work, a list of errata and a few addenda to preparations appearing in earlier parts. Otherwise, since the division into parts is merely one of convenience for publication, and has no classification significance, it is best to outline the contents *seriatim*. The figures in brackets indicate the number of syntheses associated with each division.

Part 6 concludes the section on zinc compounds (24) begun in part V, and continues with the compounds of cadmium (19) and mercury (22). Section 21 deals with scandium (2), yttrium (1), the extraction of the lanthanons, and preparation of their individual compounds (29). Section 22 deals with titanium (25), zirconium (14), hafnium (8) and thorium (12), and also describes the separation of zirconium and hafnium. Vanadium (26), niobium (19) and tantalum (13) are dealt with in Section 23, chromium (65), molybdenum (18), tungsten (13) and uranium (13) in Section 24, manganese (26) in Section 25, rhenium (16) in Section 26, iron (25) in Section 27, cobalt (36) and nickel (20) in Section 28, and the platinum metals (70) in Section 29.

In the portion devoted to special groups of materials, which occupies the latter portion of Part 8 and the whole of Part 9, the topics dealt with are adsorbents and catalysts (23), hydroxy compounds (15), isopoly- and heteropoly-acids (26), radioactive preparations (14) involving both natural and artificial isotopes, luminescent materials (25), carbonyls (19), carbonyl-nitrosyls (2), nitrosyls (9), and a section on alloys and intermetallic compounds which contains accounts of a variety of general methods as well as a number of individual procedures.

A bald recital of the contents such as the above can give only a poor idea of the great value of this work or of the great debt owed to Professor Brauer and his collaborators for this notable contribution to the reference literature of chemistry. It well deserves to take its place, as it undoubtedly will, among the standard reference works, and it is a welcome addition to the literature of a branch of chemistry which, until recently, has been all too poorly served.—CECIL L. WILSON.

BENTLEY'S TEXTBOOK OF PHARMACEUTICS. Revised by H. Davis with the collaboration of M. W. Partridge and C. L. Sargent. 6th edition. Baillière, Tindall & Cox Ltd., London. 1954. Pp. xiv + 1078, with 302 illustrations. 42s.

Different branches of science advance at different rates, some too slow, such as cancer research; some too fast, such as atomic physics, but in pharmaceutics progress comes in definite quanta. As soon as a British Pharmacopœia is published all the pharmaceutical textbooks rapidly get into the new line by appearing in new editions. Bentley is no exception. The third edition appeared in 1932, a BP year, the fifth in 1949 shortly after the 1948 BP, and now the sixth not long after the 1953 BP.

The new edition does not differ fundamentally from the last apart from some rearrangement of the contents. It is slightly smaller, an unusual development in text-

books which run to many editions. The author apparently senses the general feeling that it is too big and wisely resists the temptation to enlarge it further. The book is really four textbooks in one. In Part II under the heading of Physico-Chemical Principles there is a miniature textbook of physical chemistry. This includes among many other things accounts of viscosity, surface tension and colorimetric determination of *p*H but there is no reference to optical rotation, refractive index or absorption of visible UV light in spite of their pharmaceutical applications. Part III, dealing with pharmaceutical processes and plant, represents a medium-sized book on small and large scale chemical plant. Part V, on pharmaceutical microbiology, contains the essentials of a course in microbiology. The remaining four parts deal with the more purely pharmaceutical matters, historical, dispensing, surgical dressings and pharmaceutical preparations.

The student has the advantage that within two covers he can find most of what he needs set out with great clarity and in eminently readable form. Teachers of pharmaceutics have long recognised this book as indispensable. Such a compendium, however, must suffer from the drawback that many important sections cannot be given in sufficient detail. For example, the chapter on chromatography and ion exchange which has been added in this edition gives only the briefest description of these techniques. On the other hand there is, surprisingly enough, a certain amount of duplication. The principles set out in Part II are occasionally repeated in Part III in the description of plant (thus Fig. 11 on p. 116 representing homogenisation is essentially the same as Figs. 188 and 189 on p. 401).

The book is undoubtedly up-to-date. Plant for the demineralisation of water is described, even such novel procedures as the use of supersonic vibrations in precipitation and emulsification are included, but care has not always been taken when adding new material to remove the old. On p. 174 we are told that 'glass . . . cannot be used for the construction of large-scale plant' whereas it is stated on p. 179 that 'glass is being increasingly used in the construction of large-scale plant.' On the whole, however, considerable attention has been paid to detail. While some authorities define sublimation as direct conversion of solid to vapour and others surprisingly as the conversion of vapour to solid it is here given as 'direct conversion of solid to vapour and condensation of vapour to solid.' Nevertheless one or two slips to be found in previous editions are repeated. Copper ferricyanide is described on p. 61 as having been used for semipermeable membranes. This should be the ferrocyanide. The term 'isomotic' used on pp. 62 and 63 should surely be 'isosmotic' or 'iso-osmotic.' The ion H_3O^+ referred to four times on pp. 68 and 69 as the 'oxonium' ion is generally called the 'hydroxonium' ion, the former term being reserved for general description of ions of this type.

An interesting history of the evolution of the British Pharamcopœia is given in Part I. It seems a pity that there is no account of the nature and function of the BP Codex, the Extra Pharmacopœia and some of the other pharmaceutical publications referred to briefly in the introduction.

All of these are minor criticisms. Those concerned are to be congratulated on producing a further admirable edition of a most useful work.—M.C.

THE CHEMISTRY OF THE MORPHINE ALKALOIDS. By K. W. Bentley. Oxford University Press. 1954. Pp. xix + 433. 50s.

Reading this book is like eating cold porridge; one has nourishment but not delectation. The vast literature which has accumulated since Sertürner isolated morphine in 1805 has been reviewed with meticulous thoroughness, and no reaction has been considered too trivial to be left out. On many pages an average of about one sentence per reference is maintained. The book will be of undoubted value to the research worker in this field, but the average chemist will find that he has to search for sections of general interest (such as those describing the now-classical work which Dr. Bentley did with Sir Robert Robinson). The emphasis on details is particularly to be regretted at a time when it is becoming possible to present an interpretation of the reactions of polycyclic compounds by a consideration of their geometry (the principles of conformational analysis), as has already been done in part for morphine by Guilbert Stork ('The Alkaloids,' Vol. II). In this volume there is little reminder that the morphine molecule is not as flat as its representation on the printed page.—J.T.E.

• HOME •

Building for Steel Research

A fully equipped experimental station is being built at Sheffield for the British Steel Castings Research Association. It is expected to be ready for occupation by next year.

Tungsten Ore Prices Increased

From 20 July, Ministry of Materials selling prices of tungsten ore (wolfram and scheelite) were raised by 10s. to 170s. per unit, plus the usual 10s. charge. This follows an increase on 5s. on 16 July. From 1 July UK consumers were permitted to buy up to 75 per cent of their requirements from abroad, compared with a previous ratio of 25 per cent.

Office Hours Extended

Styrene Co-Polymers Ltd. have decided to open their Manchester offices at 1 Roebuck Lane, Sale, Manchester, on Saturday mornings from 9 a.m. to 12 noon. It is stated that this decision has been made in order to deal more promptly with an increasing volume of business, particularly in the overseas markets.

New Branch Office

The John Thompson Group of Companies has opened a new branch office in the North of England at 'Ravenswood,' Westfield Lane, Ryton-on-Tyne, Co. Durham. This group of 18 engineering companies is well known as one of the leading and largest designers and builders of steam generating plant in this country. Various companies in the group also manufacture much of the ancillary plant with which a modern generating plant is equipped.

Dental Products Rights Transferred

Except in certain overseas markets Imperial Chemical Industries Ltd. have disposed of their rights and goodwill vested in the names 'Kallodent,' 'Kallodentine' and Acrylic Denture Base in bulk, to the Dental Manufacturing Co. Ltd., of Brock House, 97 Great Portland Street, London, W.1. The transfer was effective from 1 July. The Dental Manufacturing Co. Ltd. will continue to supply these products to the former customers of I.C.I. and will provide technical service similar to that formerly available.

Lead Contamination of Food

In the House of Commons on 21 July, Major Lloyd George, Minister of Food, said that the Report of the Food Standards Committee about lead contamination would be published in about a fortnight.

Extra Metallurgy Professor

The Council of the University College of Swansea has accepted an offer from Sir Ernest Lever, chairman of Richard Thomas & Baldwins Ltd. and of the Steel Co. of Wales, of £5,000 a year for 10 years, for the establishment of an additional chair in the Department of Metallurgy, and £50,000 for laboratory equipment.

Donations to Leeds University

In addition to donations to the Man-made Fibres Division of Leeds University, the Council of the University have acknowledged the following gifts to the Department of Colour Chemistry and Dyeing:—£50 a year for seven years from the Yorkshire Dyeware & Chemical Co. Ltd., and £917 from the Wool Textile Research Council for research; and to the Department of Inorganic and Structural Chemistry, £1,200 from the Esso Development Co. Ltd., for research in the field of organic sulphur compounds. The Yorkshire Copper Works Ltd. have given £300 for scholarships in applied science, preferably metallurgy.

Disposal of Japanese Trade Marks

At the outbreak of war with Japan in 1941 there were a hundred or so trade marks on the United Kingdom Register of trade marks, the proprietors of which were Japanese enemies. These marks remained on the Register during the war in the names of the Japanese proprietors and have since been vested in the Custodian of Enemy Property for England. Subject to the protection of British and other Allied interests, it is now intended to clear the Register of such of these marks as need no longer remain registered, and to return most of the remainder to the former Japanese proprietors or their successors in title. An opportunity will be given to British and other Allied interests to object to any such assignment before the Custodian acts. Full details are given in a notice published in the Trade Marks Journal and the Official Journal (Patents) of 21 July.

· OVERSEAS ·

US Potassium Production

Domestic production of marketable potassium in the United States again reached a new high in 1953, increasing more than 13 per cent above the 1952 production, according to reports by producers to the Bureau of Mines, US Department of the Interior. Sales and apparent consumption of potassium salts both increased in 1953, 8 per cent and 4 per cent, respectively, as compared with 1952.

Mechanical Engineering Congress

It has been decided not to hold the Sixth International Mechanical Engineering Congress until 1955, but in conjunction with the Fourth European Machine Tool Exhibition a colloquium at Stresa has been planned to take place on 24 and 25 September at the Grand Hotel and des Iles Borromées, at which Dr. P. Leinweber, Professor of the Technische Hochschule of West Berlin, will present an introductory paper on 'Automation of Measuring,' which will deal with the organisation and importance of inspection of production.

International Potash Institute

Dr. E. W. Russell, head of the soil science department, Oxford University, Dr. T. Walsh, of the department of Agriculture, Dublin, and Dr. G. A. Cowie, chief technical adviser to Potash Ltd., London, were among many prominent agronomists and research workers from most of the European countries who attended the second meeting of the International Potash Institute at Zurich on 15, 16 and 17 July. Some 20 papers mostly dealing with problems relating to the agricultural use of potash, were read.

Roof of Water for Factory

A factory now being built for Whitehall Pharmaceutical Co., Parramatta, New South Wales, is to have its roof permanently covered with 6 in. of water, which, the architect maintains, will cut about 75 per cent of heat transmission through the roof; in winter it will hold the heat, and in summer it will reflect the rays of the sun. The roof is built of concrete 6 in. thick, with a coating of 1¼ in. bitumen, and has a total area of 50,000 sq. ft. It will carry 170,000 gal. of water.

Germanium in Northern Rhodesia

Germanium and lithium have been found in Northern Rhodesia, Mr. W. G. Dunlop, Member for Commerce and Industry, has announced in the Legislative Council.

Off-shore Well in Trinidad

First off-shore well in the search for oil in the British West Indies has been officially 'spudded in' off Trinidad's south-west coast in the Gulf of Paria. Six miles from the nearest land, the well is being drilled by Trinidad Northern Areas Ltd., in which the Anglo-Iranian's D'Arcy Exploration company has one third interest.

Australian Plastics Exhibition

First Australian Plastics exhibition, with the title 'The World of Plastics,' and sponsored by the Plastics Institute of Australia, N.S.W. branch, and the director of the N.S.W. University of Technology, is to take place at Sydney Town Hall from Friday, 20 August, to Wednesday, 25 August. Held in conjunction with the Plastics Retail Week, the exhibition is designed to demonstrate to the public the recent progress in plastics development.

Indian Exports

The Indian Government have decided that paints, varnishes and enamels should continue to be licensed freely for export during the period July to December, 1954, and permit export of gypsum of South India origin up to ceiling of 3,000 tons during the same period. Free licensing of export of linseed oil to all permissible destinations except French and Portuguese Possessions in India as hitherto is also to continue up to the end of December, 1954.

Natural Gas Pipeline Permit

The Federal Board of Transport Commissioners have granted Trans-Canada Pipe Lines a conditional permit to build a $300,000,000 (about £108,000,000) natural gas pipeline from the Western Province of Alberta to Eastern Canada. The 2,200-mile line—longer than any in Canada—will run as far east as Montreal, carrying relatively inexpensive Alberta gas to western communities along the route and to the prospective main market of Toronto and other Ontario centres.

· PERSONAL ·

Dr. Edward George Edwards, aged 40, head of the department of chemistry and applied chemistry at the Royal Technical College, Salford, has been appointed principal of the Liverpool City College of Technology at a salary of £1,740.

The committee representing the Royal Society and the Armourers' and Brasiers' Company has appointed Mr. K. E. Puttick Armourers' and Brasiers' Company Research Fellow from 1 October, to work at the H. H. Wills Physical Laboratory of Bristol University on the structure and deformation of pearlite.

The Council of the Royal Society has awarded Mr. and Mrs. John Jaffe donation studentships from 1 October, to:—Dr. Eileen N. Richardson to work at the physical chemical laboratory of Oxford University on the kinetics of bromination of selected aromatic compounds; and Mr. A. Korner to work at the department of biochemistry of Cambridge University on the influence of hormones on metabolism.

Mr. A. A. Bruneau has been appointed as an assistant secretary of Aluminium Ltd. He succeeds Mr. J. A. Paterson, who has resigned.

Mr. A. C. L. Van de Maele and Mr. H. M. Crozier have joined the board of the Anglo-Lautaro Nitrate Corporation. Mr. H. R. Graham and Mr. P. F. Kruger have left the board.

The title of Professor Emeritus has been conferred upon Professor H. V. A. Briscoe, on his retirement from the chair of inorganic chemistry at the Imperial College of Science and Technology.

Mr. E. le Q. Herbert, general manager of Shell Chemical Manufacturing Co. Ltd., has been co-opted as a member of the Council of the Association of British Chemical Manufacturers.

Mr. George H. Corker, manager of the Derwenthaugh Coking and Chemical Works, was among recipients of the M.B.E. at the last investiture of the summer held by the Queen at Buckingham Palace on 20 July.

Mr. F. Hobday, production manager of semastic tiling at Fort Dunlop, has been appointed works manager for Semtex Ltd. there in succession to Mr. Walter Saul who was recently made its technical manager. Mr. Hobday, who is 44, went to Dunlop's Aston Cross workshops as a junior when he was 14. His varied production experience includes the planning and supervision of giant tyre manufacture from 1933 to 1945.

The British Electricity Authority have appointed Mr. J. C. Duckworth, chief engineer of Ferranti Laboratories at Wythenshawe, as nuclear power engineer. He will organise a new branch of the chief engineer's department which will be engaged on the design, construction and operation of nuclear power stations.

Dr. E. Lester Smith, who in May 1948 discovered vitamin B_{12} (used in the treatment of pernicious anaemia) was presented with the Gold Medal in Therapeutics of the Worshipful Society of Apothecaries at a soirée held in London on 20 July. The citation, which was given by Sir Lionel Whitby, in the Great Hall of the Society, referred to Dr. Lester Smith's 'fundamental contribution in connection with vitamin B_{12}.' Dr. Smith, who lives at Harrow, is the senior biochemist on the staff of Glaxo Laboratories Ltd. In his early years with the company he was principally engaged in research on the production of vitamin D and of vitamin concentrates. In 1938 Dr. Lester Smith began the research that was to result in the isolation of vitamin B_{12}. Although the work had to be interrupted during the war when Dr. Smith transferred his energies to penicillin research, it was resumed with great vigour shortly after the end of hostilities. By this time partition chromatography had been evolved and was used in the final stages of the search. The realisation by Dr. Lester Smith that the pink bands in the chromatography columns were related to the activity against pernicious anaemia greatly hastened the final triumph and on 28 May, 1948 (ten years after the project began), the anti-pernicious anaemia factor—vitamin B_{12}—was finally isolated by Dr. Smith and his Greenford team.

Publications & Announcements

A MECHANICAL drawbench which has just been installed in the Kitts Green, Birmingham, works of James Booth & Co. Ltd., is believed to be capable of drawing the world's largest diameter aluminium-alloy tubes. When the drawbench and ancillary equipment are producing to maximum capacity it is expected that tubes with outside diameters of up to 17 in. will be possible. At the moment, however, production is being started up on smaller sizes. It is hoped, eventually, to produce the large tubes in lengths up to 35 ft., but for tubes with a thick wall the length may be limited by the maximum weight. At present this limit is approximately 300 lb. This development, it is stated, will open up an entirely new field for strong, light, aluminium-alloy drawn tubes. The new drawbench was supplied by Sir James Farmer Norton & Co. Ltd.

* * *

CLEANING of collected tramp iron and ferrous particles from permanent magnets has always been difficult, but the new 'Rapid' Ejecta Plate, made by Rapid Magnetic Machines Ltd., Lombard Street, Birmingham, has been specially designed to facilitate the removal of such material. The unit is compact and is quite easy to install. The Ejecta Plate has the general appearance of the previous Magnaplate. The face has two auxiliary poles hinged and held magnetically in position. On swinging the plate clear of the chute for cleaning, two cams operate against the face plate initially breaking the magnetic circuit, thus permitting the face plate to be swung clear of the magnet unit. The auxiliary poles are no longer under magnetic influence, allowing the collected iron to fall. The Ejecta Plate can be supplied in many widths and the magnets are available in two sizes capable of handling up to 4 in. depth of feed.

* * *

SUPPLIES of liquid depolymerised natural rubber are now available commercially. Heat processed under controlled conditions by Lorival Plastics, of Little Lever, near Bolton, Lancs, liquid rubber is supplied in two viscosities: Lorival R25, rated at 25,000 poises, and the less viscous R5 at 5,000 poises. Both are fluid at room temperature and may be stored for long periods without deterioration. Thicker or thinner qualities can be provided when necessary. Among the many outstanding applications of Lorival R is its use as a softener in raw rubber processing. Unlike mineral oils and other conventional agents, it is vulcanised into the end-product. In other industries Lorival R is ideal as a master-batch medium for paints, dyes and inks; it will impart 'cling' to lubricating materials and improve the ability of graphite compositions to withstand high pressures. Thinned, sprayed on metal and then stoved, Lorival R provides a coating that is chemically resistant to almost all corrosion agents. When mixed with aluminium flake and treated in the same way the resultant paint finish will resist red heat. The two standard types of Lorival R are supplemented by a range of liquid rubber compounds known as Lorival CR, followed by a number which indicates the type of mix and the characteristics obtainable in the end-product. All contain sulphur and various fillers and, although less stable than Lorival R, may be stored in a cool place for about six months. Among a diversity of applications for the CR compounds are their use in adhesives for rubber to metal bonding: as a binder for grinding wheels, for anti-static rubber products, corrosion resistant pipe and drum linings, brush bristle vulcanising cements, for printing rollers, the embedding of electrical circuits and for coating fabrics.

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COMPILED by Mr. Robert H. S. Robertson, a Glossary of Clay Trade Names has been issued by the clay minerals group of the Mineralogical Society of Great Britain and Ireland. Mr. Robertson is chairman of the group. Copies, which cost 4s., can be obtained from the group hon. secretary, c/o the Macaulay Institute for Soil Research, Craigiebuckler, Aberdeen.

* * *

A NEW heating panel with automatically controlled surface temperature has been introduced by the General Electric Co. Ltd., Kingsway, London, W.C.2, for the continuous drying of all types of materials such as paper and fabrics, and for drying thin layers of powders and granules. It is

said to be especially suitable for setting nylon fabric. The panel face to which the material to be heated is exposed is made of glass fibre fabric heated from behind by nickel-chromium coil elements to temperatures up to 300°. The temperature is automatically controlled by means of an indicating controller with thermo-couples fixed to the panel face. The panels can be used as a radiant heating source but in order to increase the rate of heat transfer to a material a centrifugal fan is provided, and air ducting fitted in the back. A special form of diffuser is used to distribute the air flow evenly at the panel surface. The panels are made in sizes ranging from 2 ft. by 3 ft. to 4 ft. by 8 ft. and for operation on DC, single or three phase AC supplies. A panel 6 ft. by 3 ft. would have a rating of the order of 20 kW.

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ISSUED by Evans Medical Supplies Ltd., of Speke, Liverpool, is a new booklet describing Trypure, a highly-purified preparation of the enzyme trypsin manufactured by Novo Terapeutisk Laboratorium A/S, of Copenhagen. Evans Medical Supplies Ltd. are the sole UK distributors of this product which is presented in boxes containing a 20 ml. vial of Trypure (50 mg. dry powder) and a 20 ml. vial containing 15 ml. sterile semi-isotonic phosphate buffer *p*H 7.1 (S. P. L. Sorensen) for dissolving the powder. It sells at 11s. 3d. a box and is available to hospitals only.

* * *

JULY issue of the quarterly magazine 'Technique,' published by Muirhead and Co. Ltd., precision electrical instrument makers, of Beckenham, Kent, carries an article by Mr. D. S. Tilley, the firm's development engineer, on the D-669-A frequency analyser, while another article reviews methods of facsimile transmission. Muirhead and Co. have produced a revised edition of their publication 'Muirhead Magslips,' designed to form a guide to the scope of modern servo and remote control systems.

* * *

BUILDING of the Anglo-Iranian Oil Company's 4,000,000 tons a year Kent Oil Refinery on the marshlands of the Isle of Grain is a dramatic story of achievement in the face of many difficulties. It is told in a new booklet published by the company with the title of 'The Kent Oil Refinery; the Construction Story,' with the aid of numerous photographs, maps and charts, a large number of them in colour. This booklet is written in non-technical language and is intended for the ordinary reader. For the more technically-minded, the company have produced another illustrated booklet, 'A Technical Description of the Kent Oil Refinery' which gives details of various descriptions and processes. Copies of either of these two booklets are obtainable from the General Department, Anglo-Iranian Oil Co. Ltd., Finsbury Circus, London, E.C.2.

* * *

'PHILIPS Serving Science and Industry' is a new monthly publication which has been issued by the Industrial Products Division of Philips Electrical Ltd. Similar in approach to the 'Philips Technical Review,' the new journal will be devoted to new types of industrial equipment and industrial processes covering a wide field. The first issue contains 32 illustrated pages dealing with the application of electronic instruments for measuring and recording vibration in power plants; a new installation for water purification at Rotterdam; different types of oscilloscopes and their application; and a survey of the construction and application of the electron microscope. The publication is distributed free of charge and although a substantial mailing list has already been built up, a limited number of applicants can still be accepted. Requests should be made to the Publications Department, Philips Electrical Ltd., Century House, Shaftesbury Avenue, London, W.C.2, on official notepaper and the position of the applicant should be stated.

* * *

MANY aspects of the African Oil Palm, *Elaeis guineensis*, are discussed by Miss R. M. Johnson and Dr. W. D. Raymond in 'Colonial Plant and Animal Products,' the quarterly journal of the Colonial Products Laboratory (HMSO, price 5s. net). The issue also carries details of the exports of essential oils from the British Colonies and domestic exports of essential oils from the Dominions for 1949-52. Several pages are taken up by reports of recent investigations at the Colonial Products Laboratory.

British Chemical Prices

LONDON.—Conditions on the industrial chemicals market have been quieter than of late, but no more so than is usual for the period. Despite seasonal influences the tone of the market remains firm and there is a steady flow of inquiry for shipment. Scarcity of supplies due to persistent demand has raised the prices of mercury products, mercury sulphide (red) being quoted at 29s. 3d. a lb. for 5 cwt. lots. There has been no change in the position of coal tar products, there being a good call for creosote oil and phenol and a ready outlet for most other products with the exception of pitch, the demand for which is normally quiet at this time of the year. Prices are steady and unchanged.

MANCHESTER.—Seasonal holiday conditions continue to leave their mark on business in many sections of the Manchester chemical market, though even so trade is regarded as reasonably satisfactory, with supplies of the alkalis and other heavy chemicals being taken up in fairly good quantities by leading industrial users in Lancashire and the West Riding. Prices generally are on a steady to firm basis. No more than a moderate weight of new business has been reported in the fertiliser section, though this is the usual experience at this time of the year. With an odd exception a steady movement of supplies of the tar products continues.

GLASGOW.—There has been a distinct falling off in general business in the heavy chemical industry, mainly due to the Glasgow Fair holidays operating and the approach of the adjoining towns annual vacation. Consequently, demands are few and far between.

General Chemicals

Acetic Acid.—Per ton : 80% technical, 10 tons, £86. 80% pure, 10 tons, £92 ; commercial glacial 10 tons, £94 ; delivered buyers' premises in returnable barrels ; in glass carboys, £7 ; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £130 per ton.

Alum.—Ground, about £23 per ton, f.o.r. MANCHESTER : Ground, £25.

Aluminium Sulphate.—Ex works, £14 15s. per ton d/d. MANCHESTER : £14 10s. to £17 15s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums ; 1 ton lots £58 per ton.

Ammonium Chloride. — Grey galvanising, £31 5s. per ton, in casks, ex wharf. Fine white 98%, £25 to £27 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £34 10s. per ton.

Ammonium Persulphate. — MANCHESTER : £6 5s. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £97 and £94 10s. per ton.

Antimony Sulphide.—Golden, d/d in 5-cwt. lots as to grade, etc., 2s. 2d. to 2s. 8d. per lb. Crimson, 3s. 4½d. to 4s. 5¼d. per lb.

Arsenic.—Per ton, £45 5s. nominal, ex store.

Barium Carbonate.—Precip., d/d : 4-ton lots, £39 per ton ; 2-ton lots, £39 10s. per ton, bag packing.

Barium Chloride.—£42 15s. per ton in 2-ton lots.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £42 10s. per ton d/d ; 2-ton lots, £43 per ton d/d.

Bleaching Powder.—£21 per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140-lb. bags, carriage paid : Anhydrous, £58 10s.; in 1-cwt. bags ; commercial, granular, £38 10s. ; crystal, £41 ; powder, £42 ; extra fine powder, £43 ; B.P., granular, £47 10s. ; crystal, £50 ; powder, £51 ; extra fine powder, £52.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid : Commercial, granular, £67 ; crystal, £75 ; powder, £72 10s. ; extra fine powder, £74 10s. ; B.P., granular, £80 ; crystal, £84 10s. ; powder, £87 ; extra fine powder, £86 10s.

Calcium Chloride.—70/72% solid £12 10s. per ton.

Chlorine, Liquid.—£32 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chromic Acid.—2s. 0⅝d. per lb., less 2½%, d/d U.K., in 1-ton lots.

Chromium Sulphate, Basic.—Crystals, £65 6s. 8d. per ton d/d U.K., in lots of 1 ton and over.

Citric Acid.—1-cwt. lots, 205s. cwt. ; 5-cwt. lots, 200s. cwt.

Cobalt Oxide.—Black, delivered, 13s. per lb.

Copper Carbonate.—MANCHESTER : 2s. 1d. per lb.

Copper Sulphate.—£77 per ton f.o.b., less 2% in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £9 12s.

Formaldehyde.—£37 5s. per ton in casks, d/d.

Formic Acid.—85%, £86 10s. in 4-ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1.260 S.G., £14 7s. 6d. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hydrochloric Acid.—Spot, about 12s. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—27.5% wt. £124 10s. per ton. 35% wt. £153 per ton d/d. Carboys extra and returnable.

Iodine.—Resublimed B.P., 15s. 4d. per lb. in 28 lb. lots.

Iodoform.—24s. 4d. per lb. in 28 lb. lots.

Lactic Acid.—Pale tech., 44 per cent by weight £122 per ton ; dark tech., 44 per cent by weight £73 per ton ex works 1-ton lots ; dark chemical quality 44 per cent by weight £109 per ton, ex works ; usual container terms.

Lead Acetate.—White : About £137 15s. per ton.

Lead Nitrate.—About £112 per ton.

Lead, Red.—Basis prices per ton. Genuine dry red lead, £124 5s. ; orange lead, £136 5s. Ground in oil : red, £142 15s. ; orange, £154 15s.

Lead, White.—Basis prices : Dry English in 5-cwt. casks, £130 10s. per ton. Ground in oil : English, 1 cwt. lots, 170s. per cwt.

Lime Acetate.—Brown, ton lots, d/d, £40 per ton ; grey, 80-82%, ton lots, d/d, £45 per ton.

Litharge.—£126 5s. per ton, in 5-ton lots.

Magnesite.—Calcined, in bags, ex works, £22 to £24.

Magnesium Carbonate.—Light, commercial. d/d, 2-ton lots, £84 10s. per ton, under 2 tons, £92 per ton.

Magnesium Chloride.—Solid (ex wharf), £14 10s. per ton.

Magnesium Oxide.—Light, commercial, d/d, under 1-ton lots, £245 per ton.

Magnesium Sulphate.—£15 to £16 per ton.

Mercuric Chloride.—Technical Powder, 26s. 3d. per lb. in 5-cwt. lots ; smaller quantities dearer.

Mercury Sulphide, Red.—29s. 3d. per lb., for 5-cwt. lots.

Nickel Sulphate.—D/d, buyers U.K. £154 per ton. Nominal.

Nitric Acid.—£35 to £40 per ton, ex-works.

Oxalic Acid.—Home manufacture, minimum 4-ton lots, in 5-cwt. casks, £129 10s. per ton, carriage paid.

Phosphoric Acid.—Technical (S.G. 1.700) ton lots, carriage paid, £92 per ton ; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 3½d. per lb.

Potash, Caustic.—Solid, £94 10s. per ton for 1-ton lots ; Liquid, £34 5s.

Potassium Carbonate. — Calcined, 96/98%, about £59 10s. per ton for 1-ton lots, ex-store.

Potassium Chloride.—Industrial, 96%, 1-ton lots, £23 to £25 per ton.

Potassium Dichromate.—Crystals and granular, 11⅞d. per lb., in 1-ton lots, d/d UK.

Potassium Iodide.—B.P., 13s. 1d. per lb. in 28-lb. lots ; 12s. 7d. in cwt. lots.

Potassium Nitrate.—Small granular crystals, 81s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 9½d. per lb. for 1-cwt. lots ; for 3 cwt. and upwards, 1s. 8½d. per lb. ; technical, £8 7s. per cwt. ; for 5-cwt. lots.

Sslammoniac.—Dog-tooth crystals, £70 per ton ; medium, £67 10s. per ton ; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid. — MANCHESTER : Technical 2s. 7d. per lb. d/d.

Soda Ash.—58% ex-depot or d/d, London station, about £15 5s. 6d. per ton, 1-ton lots.

Soda, Caustic.—Solid 76/77% ; spot, £26 to £28 per ton d/d. (4 ton lots).

Sodium Acetate.—Commercial crystals, about £80 per ton d/d.

Sodium Bicarbonate.—Refined, spot, £13 10s. to £15 10s. per ton, in bags.

Sodium Bisulphite.—Powder, 60/62%, £40 per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£76 to £98 per ton, according to quantity.

Sodium Cyanide.—100% basis, 9¾d. to 10¾d. per lb.

Sodium Dichromate.—Crystals, cake and powder, 10d. lb. Net d/d UK, minimum 1-ton lots ; anhydrous, 11½d. lb. Net del. d/d UK, minimum 1-ton lots.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals £28 a ton ; commercial, 1-ton lots, £26 per ton carriage paid.

Sodium Iodide.—B.P., 15s. 1d. per lb. in 28-lb. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £127 per ton.

Sodium Metasilicate.—£22 15s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, over 98% 6-ton lots, d/d station, £27 10s.

Sodium Nitrite.—£32 per ton (4-ton lots).

Sodium Percarbonate.—12½% available oxygen, £8 2s. 10½d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots : Di-sodium, crystalline, £37 10s., anhydrous, £81 ; tri-sodium, crystalline, £39 10s., anhydrous, £79.

Sodium Prussiate.—1s. to 1s. 1d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber's Salt).—About £8 10s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER : £6 10s. per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot, £32 2s. 6d. per ton, d/d, in drums ; broken, £33 2s. 6d. per ton, d/d, in drums.

Sodium Sulphite.—Anhydrous, £59 per ton ; pea crystals, £37 12s. 6d. per ton d/d station in kegs ; commercial, £23 7s. 6d. per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £23 11s. to £26, according to fineness.

Tartaric Acid.—Per cwt. : 10 cwt. or more, £11.

Titanium Oxide.—Standard grade comm., with rutile structure, £155 per ton ; standard grade comm., £135 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d : white seal, £98 10s. ; green seal, £97 10s. ; red seal, £96.

Solvents and Plasticisers

Acetone.—Small lots : 5-gal. drums, £129 per ton ; 10-gal. drums, £119 per ton. In 40,45-gal drums less than 1 ton, £94 per ton ; 1 to 9 tons, £91 per ton ; 10 to 49 tons, £89 per ton ; 50 tons and over, £88 per ton. All per ton d/d.

Butyl Acetate BSS.—£173 per ton, in 1-ton lots ; £171 per ton, in 10-ton lots.

***n*-Butyl alcohol, BSS.**—10 tons, in drums, £161 10s. per ton d/d.

***sec.*-Butyl Alcohol.**—5 gal. drums £159 ; 40 gal. drums : less than 1 ton £124 per ton ; 1 to 10 tons £123 per ton ; 10 tons and over £122 per ton ; 100 tons and over £120 per ton.

***tert.*-Butyl Alcohol.**—5 gal. drums £195 10s. per ton ; 40/45 gal. drums : less than 1 ton £175 10s. per ton ; 1 to 5 tons £174 10s. per ton ; 5 to 10 tons, £173 10s. ; 10 tons and over £172 10s.

Diacetone Alcohol.—Small lots : 5 gal. drums, £177 per ton ; 10 gal. drums, £167 per ton. In 40/45 gal. drums ; less than 1 ton, £142 per ton ; 1 to 9 tons, £141 per ton ; 10 to 50 tons, £140 per ton ; 50 to 100 tons, £139 per ton ; 100 tons and over, £138 per ton.

Dibutyl Phthalate.—In drums, 10 tons, 2s. per lb. d/d ; 45 gal. drums, 2s. ¾d. per lb. d/d

Diethyl Phthalate.—In drums, 10 tons, 1s. 10½d. per lb. d/d ; 45 gal. drums, 1s. 11¾d. per lb. d/d.

Dimethyl Phthalate.—In drums, 10 tons, 1s. 7½d. per lb. d/d ; 45 gal. drums, 1s. 8¾d. per lb. d/d.

Dioctyl Phthalate.—In drums, 10 tons, 2s. 8d. per lb. d/d ; 45 gal. drums, 2s. 9½d. per lb. d/d.

Ether BSS.—In 1 ton lots, 1s. 11d. per lb ; drums extra.

Ethyl Acetate.—10 tons lots, d/d, £135 per ton.

Ethyl Alcohol (PBS 66 o.p.).—Over 300,000 p. gal., 2s. 9d. ; 2,500-10,000 p. gal., 2s. 11½d. per p. gal., d/d in tankers. D/d in 40/45-gal. drums, 1d. p.p.g. extra. Absolute alcohol (75.2 o.p.) 5d. p.p.g. extra.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° o.p. : 500 gal. and over in tankers, 4s. 10d. per gal. d/d ; 100-499 gal. in drums, 5s. 2½d. per gal. d/d. Pyridinised 64 o.p. : 500 gal. and over in tankers, 5s. 0d. per gal. d/d ; 100-499 gal. in drums, 5s. 4½d. per gal. d/d.

Methyl Ethyl Ketone.—10-ton lots, £141 per ton d/d

Methyl *iso*Butyl Ketone.—10 tons and over £162 per ton.

isoPropyl Acetate.—In drums, 10 tons, £130 per ton d/d ; 45 gal. drums, £135 per ton d/d.

isoPropyl Alcohol.—Small lots : 5 gal. drums, £118 per ton ; 10-gal. drums, £108 per ton ; in 40-45 gal. drums ; less than 1 ton, £83 per ton ; 1 to 9 tons £81 per ton ; 10 to 50 tons, £80 10s. per ton 50 tons and over, £80 per ton.

Rubber Chemicals

Antimony Sulphide.—Golden, 2s. 3½d. to 3s. 1½d. per lb. Crimson, 3s. 4½d. to 4s. 5½d. per lb.

Carbon Bisulphide.—£61 to £67 per ton, according to quality.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—Ton lots, £76 10s. per ton.

India-rubber Substitutes.—White, 1s. 6¾d. to 1s. 10½d. per lb. ; dark, 1s. 4½d. to 1s. 8d. per lb.

Lithopone.—30%, £50 per ton.

Mineral Black.—£7 10s. to £10 per ton.

Sulphur Chloride.—British, £55 per ton.

Vegetable Lamp Black.—£64 8s. per ton in 2-ton lots.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, March-June, £18.

Compound Fertilisers.—Per ton in 6 ton lots, d/d farmer's nearest station, I.C.I. Special No. 1 £27 9s.

'Nitro-Chalk.'—£15 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean agricultural for 6-ton lots, d/d nearest station, July to September, £25 15s. per ton.

Coal-Tar Products

Benzole.—Per gal., minimum of 200 gals. delivered in bulk, 90's, 4s. 10¾d. ; pure, 5s. 2d.

Carbolic Acid.—Crystals, 1s. 4d. to 1s. 6½d. per lb. Crude, 60's, 8s. MANCHESTER : Crystals, 1s. 4½d. to 1s. 6½d. per lb., d/d crude, 8s. naked, at works.

Creosote.—Home trade, 1s. to 1s. 4d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 1s. to 1s. 8d. per gal.

Cresylic Acid.—Pale 99/99½%, 5s. 8d. per gal. ; 99.5/100%, 5s. 10d. American, duty free, for export, 5s. to 5s. 8d. naked at works.

Naphtha.—Solvent, 90/160°, 4s. 10d. per gal. for 1000-gal. lots ; heavy, 90/190°, 3s. 9½d. per gal. for 1000-gal. lots, d/d. Drums extra ; higher prices for smaller lots.

Naphthalene.—Crude, 4-ton lots, in sellers bags, £15 1s. 9d. to £22 per ton, according to m.p. ; hot pressed, £34 per ton in bulk ex-works ; purified crystals, £53 per ton d/d.

Pitch.—Medium, soft, home trade, 180s. per ton f.o.r. suppliers' works ; export trade 230s. per ton f.o.b. suppliers port.

Pyridine.—90/160°, 35s. per gal.

Toluol.—Pure, 5s. 7d. ; 90's, 4s. 10d. per gal., d/d. MANCHESTER : Pure, 5s. 8d. per gal. naked.

Xylol.—For 1000-gal. lots, 5s. 8d. to 5s. 10d. per gal., according to grade, d/d.

Intermediates and Dyes (Prices Nominal)

***m*-Cresol** 98/100%.—3s. 9d. per lb. d/d.

***o*-Cresol** 30/31° C.—1s. 4d. per lb. d/d.

***p*-Cresol** 34/35° C.—3s. 9d. per lb. d/d.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—88/89°C., 1s. 11d. per lb.

Dinitrotoluene.—S.P. 15° C., 1s. 11½d. per lb. ; S.P. 26° C., 1s. 3d. per lb. S.P. 33°C., 1s. 1½d. per lb. ; S.P. 66/68°C., 1s. 9d. per lb.

***p*-Nitraniline.**—4s. 5½d. per lb.

Nitrobenzene.—Spot, 9½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—2s. per lb.

***o*-Toluidine.**—1s. 9d. per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—5s. 6d. per lb., in casks.

Dimethylaniline.—3s. 1d. per lb., packed in drums, carriage paid.

Chemical & Allied Stocks & Shares

ALTHOUGH international developments affected sentiment, a good volume of business continued during the past month in stock markets, where hopeful views again prevailed. In fact, many industrial shares recorded substantial gains on balance for the month, and although best levels were not held, British Funds reached their highest prices since 1951. The assumption is that international developments are likely to improve, so there has been very little selling despite the big profits represented by the large advance in prices in the past few months. Many shares now show very moderate yields, but as against this it is being assumed that there are reasonable prospects of further dividend increases next year.

Many Gains Recorded

Shares of chemical and kindred companies have been active and recorded many gains compared with a month ago, though best levels were not held. Sentiment has been helped by statements at annual meetings indicating that the improved earnings shown for the past year are generally being maintained in the current year. Imperial Chemicals again attracted a large volume of buying now they are 'ex' the capitalised bonus which has doubled the ordinary capital. They are now 35s. 4½d. which would be equal to 70s. 9d. before the bonus and compares with 68s. 3d. a month ago. Laporte 5s. shares, which are also 'ex' their capitalised issue of free shares, have changed hands around 16s. 10½d. in active dealings. Albright & Wilson 5s. shares moved up to 24s. 10½d. and buyers were also about for Fisons, which rose to 54s. 6d., compared with 53s. a month ago. Hickson & Welch 10s. shares moved up from 13s. 9d. to 14s. 6d., and British Chrome Chemicals were also favoured, these 5s. shares having risen on the month from 19s. to 25s. There was also a considerable business in British Glues & Chemicals 4s. shares, which remained under the influence of the financial results, and although best levels were not held, showed a gain of 6d. on the month at 16s. 6d. Brotherton 10s. shares were also wanted, and the quotation has advanced from 27s. 6d. to 31s. Greeff-Chemicals 5s. shares rose from 11s. to 13s. In other directions, Yorkshire Dyeware & Chemicals 5s. shares were more active, but at 11s. have not quite held best levels. Monsanto 5s. shares at 26s. 10½d. were also in demand, and Borax Consolidated were favoured and have moved up to 52s. 6d., a gain of 1s. on balance. Among plastics shares British Industrial Plastics 2s. shares rose from 6s. a month ago to 7s. 4½d. and Erinoid 5s. shares moved up to 6s. 6d. British Xylonite at 39s. have not held best levels. Bakelite 10s. shares were 26s. In other directions, Coalite & Chemical 2s. shares were favoured and have risen from 2s. 9d. to 3s. 3d. William Blythe 3s. shares remained active but came back to 17s. The 4s. units of the Distillers Co. have risen from 20s. 7½d. to 22s. 10½d. under the influence of the increased profits and the raising of the dividend from 22½ per cent to 25 per cent. Boots Drug 5s. shares advanced to 26s. 6d. British Drug Houses 5s. shares were 11s. 3d. a rise of 2s. compared with a month ago. Triplex Glass 10s. shares were in good demand on higher dividend talk in the market, and at 30s. 6d. were 3s. higher on balance. Oils have not held best levels, Shell being 97s. 6d. 'ex' the capitalised share issue, while Anglo-Iranian, after reaching the new high record of £13¼, have receded to £13, awaiting a statement on the terms of the Persian oil agreement.

CRL Staff

TWELVE vacancies exist at the Chemical Research Laboratory of the Department of Scientific Research, Mr. J. Bevins, Parliamentary Secretary to the Minister of Works, revealed in the Commons recently. He added that nine of these were expected to be filled in the near future and steps were being taken to recruit the remaining three through the Civil Service Commission. Mr. Bevins also told Parliament that the present establishment of the DSIR's Chemical Research Laboratory was 193, made up of 159 non-industrial and 34 industrial staff. The corresponding number in July, 1953, was 184, made up of 153 non-industrial and 31 industrial staff. He said that the major works in the 1954-55 DSIR building programme included the Water Pollution Research Laboratory (costing £115,000), which would be completed and occupied this year.

Law & Company News

Commercial Intelligence

Increases of Capital

The following increases in capital have been announced:—ASTOR BOISSELIER & LAWRENCE LTD., from £20,000 to £63,000; J. LOWENSTEIN & CO. LTD., from £100 to £11,000; DOMESTIC CHEMICAL CO. LTD., from £2,000 to £5,000; SOUTHERN METALIFE LTD., from £1,500 to £2,000.

New Registrations

J. C. N. Wilford Ltd.

Private company. (535,672.) Capital £1,000. Wholesale or retail consulting, analytical, manufacturing, pharmaceutical and general chemists, etc. Directors: John C. N. Wilford and Ruth Wilford. Reg. office: Room 406, 329 High Holborn, London, W.C.1.

Winrow Pharmaceuticals Ltd.

Private company. (535,525.) Capital £100. Manufacturing, pharmaceutical, consulting, analytical and general chemists, etc. The first directors are to be appointed by the subscribers. Reg. office: 46/7 Chancery Lane, London, W.C.2.

Manvar Ltd.

Private company. (535,505.) Capital £25,000. Manufacturers of and dealers in varnish, paints, stains, enamels, etc. The first directors are not named. Solicitors: Slaughter & May, 18 Austin Friars, London, E.C.2.

Company News

Benn Brothers Ltd.

The directors of Benn Brothers Ltd. recommend the payment of the following final dividends, less tax, for the year ended 30 June, 1954: 3 per cent on preference shares, which with the interim dividend of 3 per cent paid in February makes 6 per cent for the year; 10 per cent on ordinary shares, which with the interim dividend of 5 per cent paid in February makes 15 per cent for the year; capital bonus of 3d. per ordinary share payable out of capital reserve.

Lewis Berger & Sons Ltd.

The directors of Lewis Berger & Sons Ltd., paint manufacturers, etc., recommend a final ordinary dividend of 11 per cent, making 15 per cent for the year to 31 March, 1954. This compares with 12 per cent for the previous year. Distribution from capital profits is repeated at 5 per cent. The consolidated profit amounted to £903,204, compared with £529,459.

A. Boake Roberts & Co. Holdings Ltd.

Group trading profit of A. Boake, Roberts & Co. Holdings Ltd., manufacturing chemists, for the year to 31 March, 1954, amounted to £209,058, compared with £22,882 for 1953. After tax and other deductions the group net profit attributable to the holding company was £85,032, against £4,804. A final ordinary dividend is recommended of 7½ per cent, making 10 per cent for the year. This is the same as for the previous year.

Monsanto Chemical Co. Ltd.

Sales of the Monsanto Chemical Co. Ltd. and its consolidated subsidiaries for the first six months of 1954 were $170,109,549—down 2.8 per cent from the sales of $175,044,261 for the same period in 1953. Earnings for the first six months of this year are $11,434,961, which, after provision for preference dividends, is equal to $2.12 a common share. Earnings for the first six months of 1953 were $2.51 a common share.

Murex Ltd.

A final dividend of 9 per cent, the same as last year, is recommended by the directors of Murex Ltd., metallurgists. This, with the interim paid in January, makes a total of 15 per cent for the year ended 30 April, 1954, also the same rate as the previous year. Group profits after all charges, except tax, were £48,000 lower at £657,000.

Negretti & Zambra Ltd.

Negretti & Zambra Ltd. are paying an interim dividend of 3 per cent on the new ordinary capital of £350,000, as compared with last year's interim of 5 per cent on £175,000. The chairman, Mr. P. D. Negretti, states that the results of the first six months of the trading year are most satisfactory and that orders continue to come in at a very satisfactory rate.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive, or a woman aged* 18-59 *inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order*, 1952.

BRITISH TITAN PRODUCTS COMPANY, LIMITED—a rapidly expanding Heavy Chemical Industry—has vacancies for the following Senior Staff positions:—

GRADUATE CHEMISTS AND CHEMICAL ENGINEERS to assist in the development and control of Chemical Plant operations at its Grimsby (Lincs.) and Billingham (Co. Durham) Factories.

Applicants should preferably be under 30 years of age, and previous experience of Chemical Plant work would be useful but not essential. Conditions of work and service are very attractive, and there are Staff Bonus and Superannuation Schemes. Commencing salary dependent on age, qualifications and experience. Application forms may be obtained from the **PERSONNEL MANAGER, BRITISH TITAN PRODUCTS COMPANY, LIMITED, KRONOS HOUSE, COPPERGATE, YORK.**

CHEMICAL ENGINEER required at **MINISTRY OF SUPPLY ESTABLISHMENT IN S.W. ENGLAND** to be concerned with development of chemical processes involving semi-technical research and the design and operation of pilot units. Qualifications 1st or 2nd Class Hons. degree in Chemical Engineering or equivalent with considerable post graduate experience in development work including design of pilot units. A house may be available within a relatively short period for selected candidate if married. Salary according to age and experience within range—Senior Scientific Officer (min. age 26) £935-£1,090; Scientific Officer £445-£815. F.S.S.U. benefits may be available. Application forms **M.L.N.S. TECHNICAL & SCIENTIFIC REGISTER (K), 26 KING STREET, LONDON, S.W.1,** quoting F501/54A. Closing date 4 September, 1954.

CHEMIST with honours degree required for research into component wear problems using radio-active methods and also other allied investigations. The position is most suitable for a young graduate without previous industrial experience, but who has a genuine interest in research of this nature. Please reply, stating age, qualifications and experience, to Personnel Manager, **JOSEPH LUCAS (ELECTRICAL) LTD., GREAT KING STREET, BIRMINGHAM,** quoting reference PM/D/17.

PRODUCTION-CONTROL LABORATORY WORKER (male or female) required for **SLOUGH TRADING ESTATE** factory making synthetic fibre products. Must have experience of accurate work and be capable of working with little supervision. Excellent wages paid. Apply, stating age, experience and salary required. **BOX No. C.A. 3341, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

SITUATIONS VACANT

THE A.P.V. COMPANY LTD. require two **TECHNICAL ASSISTANTS** for the Chemical Engineering Department. Applicants should be in fourth or fifth year of National Certificate studies and a knowledge of thermodynamics and fluid mechanics would be an advantage. Apply in writing to the **MANAGER, C.E.D., THE A.P.V. CO. LTD., WANDSWORTH PARK, S.W.18.**

FOR SALE

ALLEY & MACLELLAN A.C.I. **VACUUM PUMP** for maintaining 24 in. vacuum. Vertical water cooled. Displacement 150 cu. ft. air per minute. Filter unloader and pressure gauge reading 80 p.s.i. **F. J. EDWARDS LTD., 359, EUSTON ROAD, LONDON, N.W.1.** EUSton 4681.

CHARCOAL, ANIMAL AND VEGETABLE horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—**THOS. HILL-JONES, LTD., "INVICTA" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE 3285 EAST.**

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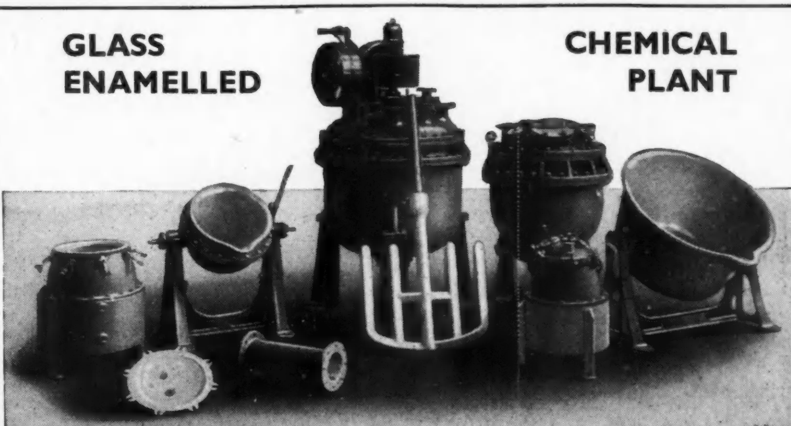

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